US Army Corps
of Engineers®
Walla Walla District
Portland District

# Environmental Assessment

## Avian Predation Deterrent Program for the Protection of Salmonids, Lower Columbia and Snake Rivers Dams, Washington and Oregon

March 2005

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| **Lead Agency:** | U.S. Army Corps of Engineers<br>Portland and Walla Walla Districts |
| **Under Contracted Assistance from:** | U.S. Department of Agriculture<br>Animal and Plant Health Inspection Service<br>Wildlife Services, Western Region |

## Summary

This Environmental Assessment (EA) addresses the environmental impacts of the Corps' Avian Predation Deterrent (APD) Program. This program implements the requirements of the National Marine Fisheries Service's (NMFS) Final Biological Opinion on the Reinitiation of Consultation on Operation of the Federal Columbia River Power System (FCRPS) (2000) Reasonable and Prudent Alternative (RPA) action 101. The RPA states the Corps shall implement and maintain an effective means of discouraging avian predation at the FCRPS dams where avian predator activity is observed.

Pertinent and current information available in the *Columbia River System Operation Review EIS* (CORPS et al. 1995) and the *Lower Snake River Juvenile Salmon Migration Feasibility Report/EIS* (CORPS et al. 2002a) have been incorporated by reference. This EA is tiered off these two Environmental Impact Statements (EIS's).

The No-Action (No Change) Alternative represents the current program. The current program consists of technical assistance, non-lethal and lethal control methods (tools), and research and development, as described in the body of this environmental assessment. Other alternatives considered were Non-Lethal Tools Only, Exhaust all Non-Lethal Tools First, No Corps Program, and Lethal Tools Only.

The proposed program was evaluated for its affect on threatened and endangered species. The determination was made that the program "may affect, but is not likely to adversely affect" bald eagles, bull trout, Snake River spring/summer and fall Chinook salmon, sockeye salmon and steelhead, Upper Columbia River spring Chinook salmon and steelhead, Lower Columbia River chum salmon, Chinook salmon, and steelhead and Mid-Columbia River steelhead. A "no effect" determination was made for the other listed species. The EA also evaluates the effects on birds that would be hazed or killed under the program.

When taken together with other past, present, and reasonably foreseeable future actions, the current program would have no significant environmental impact. This finding is consistent with that of the United States Department of Agriculture (USDA), which manages animal damage control programs on a regional and national level and carries out the Corps' APD program, under contract. USDA documented their findings on a regional level in an EA, *Alternative Strategies for the Management of Damage Caused by Migratory Birds in the State of Washington* (USDA-APHIS-WS, 2001). USDA documented their findings on a national level in an EIS, *Animal Damage Control Program*) (USDA-APHIS-ADC, 1997, revised).

This EA has been prepared in compliance with the National Environmental Policy Act (NEPA) and currently no significant impacts have been identified. If no significant impacts are identified during the public review process, an EIS will not be required and full compliance with NEPA would be achieved once a Finding of No Significant Impact (FONSI) is signed.

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADC | Animal Damage Control (former name of Wildlife Services program) |
| APD | Avian Predation Deterrent |
| APHIS | Animal and Plant Health Inspection Service (USDA agency) |
| APHIS-WS | Wildlife Services (USDA-APHIS program) |
| BA | Biological Assessment |
| BBS | Breeding Bird Survey |
| BiOp | Biological Opinion |
| BPA | Bonneville Power Administration |
| CAA | Clean Air Act |
| CAR | Coordination Act Report |
| CBC | Christmas Bird Count |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| CMZA | Coastal Marine Zoning Act |
| Corps | United States Army Corps of Engineer |
| CR | Conservation Recommendation |
| CRGSA | Columbia River Gorge Scenic Area |
| CRITFC | Columbia River Intertribal Fish Commission |
| CTUIR | Confederated Tribes of the Umatilla Indian Reservation |
| CWA | Clean Water Act |
| CY | Calendar Year |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| EO | Executive Order |
| ESA | Endangered Species Act |
| EPA | Environmental Protection Agency |
| e.g. | exempli gratia (for example) |
| et al. | et alia (and others) |
| et seq. | et sequen[s] (and the following one[s]) |
| FCA | Flood Control Act |
| FCRPS | Federal Columbia River Power System |
| FDA | Food and Drug Administration |
| FIFRA | Federal Insecticide, Fungicide, and Rodentcide Act |
| FONSI | Finding Of No Significant Impact |
| FPOM | Fish Passage Operations and Maintenance Coordination Team |
| FR | Federal Register |
| FY | Fiscal Year |
| GBT | Gas Bubble Trauma |
| INAD | Investigational New Animal Drug |
| i.e. | id est (that is) |
| ITS | Incidental Take Statement |
| IWDM | Integrated Wildlife Damage Management |
| MA | methylene antanile |

| | |
|---|---|
| MBTA | Migratory Bird Treaty Act |
| MIS | Management Information System |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NAS | National Audubon Society |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NPPC | Northwest Power Planning Council |
| NWRC | National Wildlife Research Center |
| OAHP | Office of Archeological and Historic Properties |
| OSDA | Oregon State Department of Agriculture |
| ODFW | Oregon Department of Fish and Wildlife |
| PL | Public Law |
| PIT | Passive Integrated Transponder |
| PUD | Public Utility District |
| RCRA | Resource Conservation Recovery Act |
| RM | River Mile |
| RPA | Reasonable and Prudent Alternative |
| RHA | River and Harbor Act |
| SHPO | State Historic Preservation Office |
| SWD | Seattle Water Department |
| TDG | Total Dissolved Gas |
| USC | United States Code |
| USBR | United States Bureau of Reclamation |
| USDA | United States Department of Agriculture |
| USDC | United States Department of Commerce |
| USDI | United States Department of Interior |
| USGS | United States Geological Survey |
| USFWS | United States Fish and Wildlife Service |
| WDFW | Washington Department of Fish and Wildlife |
| WSDA | Washington State Department of Agriculture |
| WOS | Washington Ornithological Society |

# Environmental Assessment
# Avian Predation Deterrent Program
# Lower Columbia and Lower Snake Rivers

## 1.0 PURPOSE AND NEED

### 1.1 Introduction

The U.S. Army Corps of Engineers (Corps) is experiencing losses of Federally listed juvenile salmonid fish to piscivorous (fish-eating) birds at the eight hydroelectric dams (projects) operated by the Corps on the Lower Columbia and Lower Snake Rivers in the States of Oregon and Washington. Ten species of anadromous salmonids listed under the Endangered Species Act (ESA) are found throughout portions of the Lower Columbia and Lower Snake Rivers that are affected by these dams. Piscivorous birds congregate in the tailrace area below the dams in spring and summer to feed on congregated fish, and among them, out-migrating juvenile salmonids. Juvenile salmonids are especially vulnerable to predation by birds and other predators when released at the bypass facilities or brought to the surface of the tailrace, and some suffer additional predation because they are disoriented or stunned due to passage through turbines and spillways.

Under the ESA, Federal agencies must consult with NMFS and U.S. Fish and Wildlife Service (USFWS) to ensure that Federal actions do not jeopardize the continued existence of ESA listed species. The Corps, in conjunction with several other Federal agencies, entered into formal consultation with NMFS and USFWS for the operation of the FCRPS, which included the eight dams. NMFS reviewed the effects of the FCRPS on listed anadromous fish in the Columbia River basin and developed a Biological Opinion (BiOp), *Final Biological Opinion on the Reinitiation of Consultation on* Operation of the Federal Columbia River Power System (NMFS 2000b). In the NMFS FCRPS BiOp, NMFS identified Incidental Take Statements (ITS), Conservation Recommendations (CR), and Reasonable and Prudent Alternative (RPA) actions to mitigate impacts to listed anadromous species. One of these actions, RPA action 101 states:

> <u>Action 101</u>: *The Corps, in coordination with the NMFS Regional Forum process, shall implement and maintain effective means of discouraging avian predation (e.g. water spray, avian predator lines) at all forebay, tailrace, and bypass outfall locations where avian predator activity has been observed at FCRPS dams. These controls shall remain in effect from April through August, unless otherwise coordinated through the Regional Forum process. This effort shall also include removal of the old net frames attached to the two submerged outfall bypasses a Bonneville Dam. The Corps shall work with NMFS, FPOM [Fish Passage Operations and Maintenance Coordination Team], USDA [U.S. Dept. of Agriculture] Wildlife Services, and USFWS [U.S. Fish and Wildlife Service] on recommendations for any additional measures and implementation schedules and report progress in the annual facility operating reports to NMFS. Following consultation with NMFS, corrective measures shall be implemented as soon as possible.*

The Corps has prepared this EA to describe the Corps' Avian Predation Deterrent (APD) Program and evaluate the alternatives and methods to implement this program in compliance with this RPA.

The FCRPS 2000 BiOp's Reasonable and Prudent Alternative (RPA) provides the baseline condition for which effect determinations are evaluated for ESUs affected by the FCRPS dams and projects. NMFS and USFWS have coordinated this multi-species opinion and the USFWS opinion on the effects of hydrosystem operations on Columbia River basin species within its jurisdiction, dated May 12, 2000. The two agencies intend the recommendations and requirements of these opinions to be mutually consistent. They represent the Federal biological resource agencies' recommendations of measures that are most likely to ensure the survival and recovery of all listed species and that are within the current authorities of the Action Agencies. The Fish Passage Operations Maintenance (FPOM) Coordination Team annually evaluates the current APD program. USFWS and NMFS are members of FPOM, which reviews the Corps' implementation of the 2000 Biological Opinion.

## 1.2 Location and Setting

This EA addresses the effects of the APD program at the eight Corps-operated hydroelectric dam projects on the Lower Columbia and Lower Snake Rivers, in Washington and Oregon. They are Bonneville, The Dalles, John Day, and McNary on the Lower Columbia River and Ice Harbor, Lower Monumental, Little Goose, and Lower Granite on the Lower Snake River. Plate 1 shows the geographic locations of the project sites.

The geographic boundary for the program includes the forebay, tailrace, and fish ladder(s) and fish outfall bypass at each dam. The boundary extends about 1,000 feet upstream and 1,000 feet downstream of each dam. It also includes the middle of the river area between Columbia River miles (RM) 140 to 144 where juvenile salmonids are released from trucks aboard barges. This release site may be moved to Bonneville Dam in the future, if an existing discharge system is modified.

## 1.3 Background

Prior to the NMFS 2000 BiOp, the Corps' avian predation deterrent program was identified in the Corp's Fish Passage Plan (Appendix D; CORPS 2004). The Plan originated around 1983 with the creation of the Northwest Power Planning Council and is reissued each calendar year. Excerpts from the current 2004 calendar year plan are contained in Appendix D. The Corps implements the program, with the assistance of the USDA Animal and Plant Health Inspection Service/Wildlife Services (APHIS-WS). Their expertise and assistance has been used to develop alternative strategies for the reduction in piscivorous bird predation at Corps operated hydroelectric dams. Initial efforts to reduce predation by piscivorous birds were focused on restricting overhead access (using exclusion wires) to areas where juvenile fish (smolts) are most susceptible to predation. In addition, an intensive hazing program reinforced with limited lethal control, where necessary, has been used under the current program to reinforce the effectiveness of non-lethal measures and remove persistent individual piscivorous birds.

The associated economic cost to mitigate the vulnerability of smolts below hydroelectric dams can be estimated in several ways. One way to estimate damage is to estimate the number of juvenile salmonids eaten by avian predators and apply a dollar value to each individual of each species. Another way to take into account the costs involved is to improve juvenile salmonid survival. The value of ESA-listed juvenile salmonids lost to predation is not presented in this EA, because it is not easily determined. Engemann et al. (in press) reviewed various methods for applying monetary valuations for ESA-listed species so that economic analyses of management actions could be used to help guide and evaluate management decisions. For example, the economic loss or relative value of juvenile salmonid to society, attributed to avian predation, may be represented by the costs associated with the development and implementation of mitigation measures that improve the survival of those juvenile salmonids past each hydroelectric dam. An example of the economic valuation process is presented in Table 1.1. The figures used are estimates and are provided for illustrative purposes only.

**Table 1.1. Juvenile Salmonid Economic Valuation**

| **Description** | **Estimated Data** |
|---|---|
| Average cost per year for salmonid restoration program | $500 million |
| Anadromous adults recorded at Bonneville in 2001 | 4.4 million |
| Cost of restoration efforts per adult | $114 |
| Local economic value of one adult (in 1998 dollars) | $186 |
| Total value of one adult | $300 |
| Number of Bonneville smolts required to produce one adult salmonid (average 2% smolt to adult return rate) | 50 |
| Average value of a juvenile salmonid individual | $ 6 |

## 1.4 Purpose and Need

The purpose of the APD Program is to implement and maintain an effective means of discouraging piscivorous bird predation at all forebay, tailrace, and bypass outfall locations at the eight Corps' dams on the Lower Columbia and Lower Snake Rivers, and related dam operation activities. This EA considers the issues and evaluates alternatives available to the APD Program that comply with the RPA action 101 of the NMFS 2000 BiOp.

## 1.5 Authority

### 1.5.1 Corps Authority

Each of the affected Corps dams is authorized to provide for slackwater navigation, irrigation, hydroelectric power generation, recreation, and fish and wildlife. This includes authority to protect fish and wildlife resources. Specific project authorization for each dam is listed below.

**BONNEVILLE--BONNEVILLE POOL**

The project was authorized by the Federal Emergency Administration Act of 1933, the River and Harbor Act (RHA) of 1935, the Bonneville Project Act of 1937; and Flood Control Act (FCA) of 1950 (Public Law [PL] 516). The FCA of 1944 modified the project for recreational facilities under Code 710. Bonneville Dam was dedicated in 1937. Bonneville second powerhouse was completed in 1982. Bonneville new navigation lock opened in 1993. Location is approximately Columbia RM 146.

**THE DALLES--LAKE CELILO**

The project was authorized by the FCA of 1950 to provide a dam, powerhouse, navigation lock and appurtenance facilities. The FCAs of 1944, 1946 and 1954 modified the project for recreational facilities under Code 710. The Dalles Lock and Dam was dedicated in 1957. Location is approximately Columbia RM 192.

**JOHN DAY--LAKE UMATILLA**

The project was authorized by the FCA of 1950 to provide a dam, power plant, navigation lock, and slack water lake. Authority to develop and maintain recreation facilities on water resource projects is authorized in Section 4 of FCA of 1944 (PL 534, 78th Congress) as amended by Section 207 of PL 87-874, and further amended by the Land and Water Conservation Fund Act of 1965. Authority to develop and maintain fish and wildlife facilities is authorized by the FCA of 1950 (PL 81-516). The John Day Lock and Dam Project was dedicated in 1968. Location is approximately Columbia RM 214.

**McNARY LOCK AND DAM--LAKE WALLULA**

The project was authorized by Section 2 of the FCA of 1945 (PL 79-14, 79th Congress, 1st Session), 2 March 1945, in accordance with House Document 704, 75th Congress, 3rd Session. The project was originally called Umatilla Dam, but the RHA of 1945 renamed the dam in honor of the late Senator Charles L. McNary.

Recreation was authorized in the FCA of 1944 (PL 78-534), as amended. The study to construct a second powerhouse at McNary Dam and Lake was authorized by the Water Resource Development Act of 1976 (PL 94-587). The second powerhouse was authorized for construction by the Water Resources Development Act of 1986 (PL 99-662, 99th Congress, 2nd Session), November 17, 1986, as specified by the report of the Chief of Engineers dated June 24, 1981. Location is approximately Columbia RM 292. The second powerhouse was deauthorized on November 16,1991.

**ICE HARBOR LOCK AND DAM--LAKE SACAJAWEA**

The Ice Harbor Project was authorized by Section 2 of the FCA of 1945 (PL 79-14, 79th Congress, 1st Session), March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. Recreation was authorized in the FCA of 1944, as amended (PL 78-534). Location is approximately Snake RM 10.

**LOWER MONUMENTAL LOCK AND DAM--LAKE HERBERT G. WEST**
The project was authorized by the FCA of 1945 (PL 79-14), in accordance with House Document 704. Recreation was authorized in the FCA of 1944 (PL 78-534), as amended. Location is approximately Snake RM 41.5.

**LITTLE GOOSE LOCK AND DAM--LAKE BRYAN**
The project was authorized by Section 2 of the FCA of 1945 (PL 79-14), 79th Congress, 1st Session, March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. Recreation was authorized in the FCA of 1944, as amended. Location is approximately Snake RM 70.

**LOWER GRANITE LOCK AND DAM--LOWER GRANITE LAKE**
The project was authorized by Section 2 of the FCA of 1945 (PL 79-14), 79th Congress, 1st Session, March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. Recreation was authorized in the RHA of 1944 as amended. Location is approximately Snake RM 107.5.

### 1.5.2 APHIS-WS Authority

The Corps has a work plan/financial plan with USDA APHIS-WS to perform avian predation deterrent activities at the eight dams. The USDA APHIS Wildlife Services program is given authority by the Animal Damage Control Act of 1931 (7 U.S.C. 426-426c; 46 Statute 1468) as amended, to use the most efficient and humane methods currently available for reducing or alleviating damage associated with wildlife. The Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988, as amended, authorized APHIS-WS to conduct activities and to enter into agreements and contracts with public and private agencies in the control of nuisance mammals and birds.

## 1.6 Scope of Analysis

This EA examines alternatives for the APD Program to reduce actual and potential predation by piscivorous birds on ESA-listed anadromous fish species at the eight dams.

The focus of this analysis is to evaluate alternatives that could implement RPA action 101. While the NMFS 2000 BiOp includes additional RPA actions (RPA's 102 and 103) related to avian predation, they involve long-term research studies and the results are not available for consideration in this EA. RPA 102 calls for an evaluation of avian predation on juvenile salmonids in the FCRPS reservoirs above Bonneville Dam. RPA 103 calls for study of predation by white pelicans on juvenile salmon in the McNary pool and tailrace. The proposed actions from these studies will be evaluated for consistency with the selected alternative for the APD program at the dams and any additional environmental compliance will be completed at that time, if necessary.

This analysis will address effects to primary and secondary predators that have been observed at the project sites, which are listed in the Table 1.2 below.

Primary avian predator species are defined as having been consistently identified at the Lower Columbia and Snake Rivers dams over the 6-year period from Fiscal Year (FY) 1997 to 2002. Secondary predators are defined as those seen occasionally on-site.

**Table 1.2. List of Primary and Secondary Predators Observed at Project Sites**

| **Primary Predators** | **Secondary Predators** |
|---|---|
| California gull (*Larus californicus*) | Caspian tern (*Sterna caspia*) |
| Ring-billed gull (*L. delawarensis*) | Forster tern (*S. forsteri Nuttall*) |
| Herring gull (*L. argentatus*) | Common merganser (*Mergus merganser*)* |
| Double-crested cormorant (*Phalacrocorax auritus*) | American white pelican (*Pelecanus erythrorhynchos*) |
| | Great-blue heron (*Ardea herodias*) |
| | Belted kingfisher (*Ceryle alcyon*) |
| | Western grebe (*Aechmophorus occidentalis*) |
| | Bonaparte gull (*Larus Philadelphia*) |

*female common mergansers were misidentified as red-breasted mergansers in Appendix G tables

### 1.7 Related Environmental Analyses

Below is a list of environmental analyses, prepared by the Corps and other Federal agencies, that address impacts of avian predators, predation on juvenile salmonids by birds, and managing damage caused by birds. The Corps considered these analyses when preparing this EA.

- United States Army Corps of Engineers, Bonneville Power Administration (BPA), and United States Bureau of Reclamation (USBR); *Columbia River System Operation Review EIS* (CORPS et al. 1995). The Corps, BPA, and USBR analyzed changes in Columbia River system operations and the effect of those changes on users of the system and the environment. Pertinent and current information available in the EIS, from which this EA is tiered, is incorporated by reference.

- United States Army Corps of Engineers; *Lower Snake River Juvenile Salmon Migration Feasibility Report/EIS* (CORPS et al. 2002a). The Corps issued a Final EIS analyzing improvements for juvenile salmon migration through Lower Snake River dams and reservoirs. Pertinent and current information available in the EIS, from which this EA is tiered, is incorporated by reference.

- USDI-USFWS; *Final Biological Opinion on the Effects to Listed Species from Operations of the FCRPS* (USFWS 2000). The USFWS BiOp addresses the effects of FCRPS operations on listed species and designated critical habitat identified in accordance with the ESA (16 USC 1531 et seq.), as well as Reasonable and Prudent Actions for bull trout and white sturgeon.

- Bonneville Power Administration; *EA and FONSI for the Avian Predation on Juvenile Salmonids in the Lower Columbia River Research Project* (BPA 2001). The EA analyzes the impact of piscivorous bird research activities in the Columbia River estuary.

- United States Department of Commerce (USDC)/National Oceanic and Atmospheric Administration (NOAA)/NMFS; *Final Biological Opinion on the Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin* (NMFS 2000b). The NMFS BiOp addresses the effects of the proposed actions on listed species and designated critical habitat, identified in accordance with the ESA (16 USC 153 et seq.), and sets forth the Reasonable and Prudent Alternative.

- USDC / NOAA /NMFS; *Final EIS on Anadromous Fish Agreements and Habitat Conservation Plans for Wells, Rocky Reach, and Rock Island Hydroelectric Projects* (NMFS 2000a). The EIS addresses fish passage requirements and mitigation measures, including predator control, at Douglas and Chelan County Public Utility District facilities.

- United States Department of Interior (USDI)/USFWS; *Draft EIS on Double-crested Cormorant Management* (USFWS 2001). The DEIS is being developed to assess various alternatives for managing increasing populations of double-crested cormorant. The need for action is based upon the correlation between increasing populations and the growing concern about associated negative impacts, thus creating a substantial management need to address those concerns. Decisions affecting cormorant management resulting from the Record of Decision and Final EIS will be incorporated into the Corps' program.

- USDA-APHIS; *Animal Damage Control (ADC) Program Final EIS* (USDA 1997, revised). The EIS analyzes the legal, administrative, biological, economic, and social considerations of wildlife damage management activities.

- USDA-APHIS-WS; *EA and FONSI for the Management of Damage Caused by Migratory Birds in the State of Washington* (USDA 2001). The EA analyzes migratory bird damage management activities in Washington State for the protection of property, agriculture, public health and safety, and natural resources.

- USDA-APHIS-WS; *EA and FONSI on Piscivorous Bird Damage Management for the Protection of Juvenile Salmonids on the Mid-Columbia River* (USDA 2003). The EA analyzes APD management activities for the protection of juvenile salmonids on the Mid-Columbia River in Washington State.

# 2.0 PROPOSED ACTION AND ALTERNATIVES

The Corps evaluated a range of alternatives to reduce avian predation on juvenile salmonids at the eight dams. These include:

1. No-Action (No Change) Alternative – Current Program
2. Non-Lethal Tools Only Alternative (Proposed Action)
3. Exhaust All Non-Lethal Tools First Alternative
4. No Corps Program Alternative
5. Lethal Tools Only Alternative

Any additional alternatives identified during this NEPA process will be evaluated and added if determined to be reasonable and feasible alternatives.

## 2.1 Alternative 1: No Action (No Change) Current Program

Alternative 1, the No Action (No Change) alternative, is used as the baseline for comparison with the other alternatives. The "No Action" alternative is a procedural NEPA requirement (40 CFR 1502.14(d)), and is a feasible and reasonable alternative that could be selected.

The "No Action" (No Change) alternative would continue the current Corps avian predation deterrent program, which attempts to reduce piscivorous bird predation on threatened and endangered juvenile salmonids at the eight dams on the Lower Columbia and Snake Rivers. At each dam, the Corps implements both static (e.g. wire exclusion systems, propane exploders, electronic harassment devices, mylar tape and flags) and active (e.g. pyrotechnics, harassment shooting, vehicle harassment, and shooting) direct control measures to reduce avian predation. The timing of damage management activities is dependent upon the out-migration of smolts and the number of piscivorous birds congregating in the forebay and tailrace areas. Implementation measures to reduce avian predation on salmonids below the Lower Snake River Dams generally begin in March and end in July. Measures may be implemented year-round at the four Lower Columbia River hydroelectric dams when juvenile salmonids are present. Non-lethal methods are preferentially used to abate bird usage of tailraces and forebay areas. When necessary under the current program, non-lethal methods are supplemented with limited lethal control to provide aversion conditioning to persistent individuals and flocks of birds.

The most appropriate, effective, and biologically sound tools are used to resolve damage caused by piscivorous birds. This approach is known as Integrated Wildlife Damage Management (IWDM). In general terms, IWDM is comprised of all the tools available to resolve a particular wildlife problem. These tools may include recommending the alteration of the birds' cultural practices, as well as habitat and behavioral modification to prevent damage. The reduction of bird damage may also require that individuals within local populations be reduced through lethal tools. The best available research is used to determine the most effective and practical tools for reducing bird damage. The magnitude, geographic extent, frequency, and duration of the problem are used to determine if action is warranted. An IWDM approach would continue to be used to reduce piscivorous bird predation on juvenile salmonids at the eight dams.

Many of these bird management techniques or tools are currently being used at Corps dams on the Lower Columbia and Snake Rivers. Non-lethal tools such as overhead wiring systems, propane cannons (Martin and Martin 1984), pyrotechnics, effigies, mylar tape and various other harassment tools are used with varied success in deterring birds. Other non-lethal tools available, but not used to date, include habitat modification, translocation, nest removal, and tactile, chemosensory, and physiological repellents. Lethal tools currently being used include shooting and euthanasia following live capture. Other lethal tools that are available under the No Action (No Change) alternative include egg addling/destruction and toxicants/avicides. All current avian deterrent techniques and tools being used comply with appropriate Federal, State, and local laws.

Evaluation of the appropriateness of each strategy is conducted. Tools are evaluated in the context of their availability (legal and administrative) and suitability based on biological, economic, and social considerations. Following this evaluation, the tools deemed to be practical are incorporated into a damage management strategy for the situation. At the dams on the Lower Columbia and Snake Rivers, monitoring and evaluation of the situation is used to devise the most practical and effective solution. If one tool or combination of tools fails to reduce piscivorous bird usage of areas where juvenile salmonids are susceptible to predation, a different strategy or a modified strategy may be implemented.

To meet the goal of reducing piscivorous bird predation on threatened and endangered juvenile salmonids, the Corps in the past has requested the assistance of APHIS-WS to provide technical and/or direct control assistance. Under the Current Program alternative, the Corps would continue to request both technical and direct control assistance from APHIS-WS. In the past, the Corps actions have been physically implemented by APHIS-WS. The Corps intends to continue to use the APHIS-WS Decision Model (Appendix B) to assess, implement and maintain an effective program to discourage avian predation. In terms of the APHIS-WS Decision Model, most damage management efforts consist of a continuous feedback loop between receiving the request, implementing a strategy, and monitoring the reaction of the birds. In addition, piscivorous bird populations and rates of smolt predation are monitored annually. This monitoring is incorporated into the decision model.

APHIS-WS obtains a depredation permit from USFWS, which authorizes take, possession and transport of migratory non-game birds (except bald or golden eagles and endangered or threatened species). Migratory birds may be hazed, without APHIS-WS assistance, and/or without a USFWS permit, provided hazing is not performed at nesting colonies or those locations where migratory birds are sitting on nests. When requested, APHIS-WS instructs Corps employees in the safe use and handling of pyrotechnic devices. Corps employees are not authorized to conduct lethal take, as the depredation permit only allows delegated take authority to APHIS-WS employees under the permitee's direct supervision.

Below is a more detailed description of the components of the No Action (No Change) alternative:

***Technical Assistance:***

Corps biologists request technical assistance from APHIS-WS, which includes instruction and/or information on both non-lethal and lethal tools to reduce predation by piscivorous birds. Technical Assistance is defined as advice, recommendations, information, equipment, literature, instructions, and materials to use in managing wildlife damage problems and understanding wildlife damage management principles and techniques.

*Direct Control Assistance*

Corps biologists request direct control assistance from APHIS-WS. Control assistance is defined as field activities conducted or supervised by APHIS-WS personnel. The Corps may request control assistance when it has determined that the problem cannot be reasonably solved by technical assistance or the professional skills of APHIS-WS personnel are required for effective problem resolution.

*Non-Lethal Control Tools*:

The Corps oversees the implementation of all practical and effective non-lethal tools known to reduce predation by piscivorous birds on juvenile salmonids. These non-lethal tools are used before any lethal tools are used. In an effort to reduce avian predation where smolts are most vulnerable, vast overhead wiring systems, which stretch across the tailrace areas of each dam, have been constructed and are maintained. Table 2.2 identifies the approximate coverage area of the existing exclusion systems. Strands of reflective tape (Mylar) are tied at spaced intervals to the wire to prevent bird collisions and entanglement. Propane cannons, pyrotechnics, effigies, and various other harassment tools are also used, with varied success in deterring birds. More details of these tools are described further in this EA. Table 2.1 identifies tools that are "Currently in Use" and are "Available, But Not Currently Used".

*Lethal Control Tools:*

Limited lethal control, where necessary, are used under the current program to supplement non-lethal tools to provide aversive conditioning to persistent individual birds. Lethal tools for reducing bird damage may include shooting (steel shot), egg addling[1]/destruction, or those methods, which are determined effective and practical,

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[1] Addling refers to oiling, addling, or puncturing eggs. Oiling eggs prevents gases from diffusing through an egg's outer membranes and pores in the shell, thereby causing the embryo to die of asphyxiation (Blokpoel and Hamilton 1989, Christens and Blokpoel 1991). Addling (or shaking) involves vigorously shaking the eggs until sloshing is heard, thus destroying the embryo. Puncturing is done by pushing a thin, strong pin through the shell, which introduces bacteria. Eggs are replaced so that the bird continues to incubate rather than relaying another clutch.

and are further discussed in sections "Tools Currently in Use" and "Tools Available, But Not Currently Used". Shooting is the only lethal tool that is currently in use. Shooting can be effective in removing birds that do not respond to non-lethal tools and enhances the effectiveness of frightening techniques and exclusion wiring systems. Shooting is conducted primarily from the shoreline, and occasionally from the dam. Birds are retrieved after shooting whenever reasonably possible.

Lethal tools are largely used under the current program for primary predators (see Table 1.2). However, very limited lethal control of western grebes, great-blue herons, and mergansers (Appendix G, Table 1) has been authorized infrequently in the past under the current program when individuals' congregate in or below fish ladders, spillways, and outfalls, and only when non-lethal deterrents were ineffective. Lethal tools would not be used on great blue herons due to potential concern for recent reduction of great-blue heron colonies. Lethal tools would also not be used on American white pelicans as they are listed as a Washington State endangered species. While these species would not be subject to lethal control, inadvertent harassment may occur in locations where primary predators (see Table 1.2) feed on smolt. Lethal take of other avian species, such as secondary predators (identified in Table 1.2), would not be allowed for the purpose of juvenile fish protection.

*Access to Research and Development:*

The Corps adjusts its ADP program using information developed by the National Wildlife Research Center (NWRC) and other relevant scientific studies. The NWRC functions as the research arm of APHIS-WS by providing scientific information for the development of biologically sound tools for wildlife damage management. The NWRC is active in the development of new and improved wildlife damage management tools, and as new tools are developed, can be incorporated into the current program. NWRC/WS scientists work closely with wildlife managers, researchers, field specialists and others to develop and evaluate wildlife damage management techniques. For example, NWRC/WS research has been instrumental in the development, identification, and/or testing of:

1) Disturbance techniques to reduce nesting or feeding by gulls;
2) Food-grade oils to reduce hatchability of gull eggs;
3) Diet analysis and food habits of piscivorous birds;
4) Efficacy of non-lethal and lethal control at dams, hatcheries, roosts, and elsewhere; and
5) Direct predation by piscivorous birds

Ongoing and future piscivorous bird research conducted throughout the Columbia River basin is to be incorporated in the IWDM approach (e.g. Steuber et al. 1995, York et al. 2000, Collis et al. 2001, Searing et al 2002, Demarchi et al. 2003).

Table 2.1 below lists the tools that are available under the No-Action (Current Program) alternative for reducing avian predation of juvenile salmonids. The table is divided into two sections: tools currently in use and tools available, but not currently used. The following text will describe these tools. Further discussion of these types of tools is found in Jones et al. (1996, 1997, 1998, 1999), the USDA-APHIS ADC Programmatic EIS (1997, revised) and the USDA-APHIS Mid-Columbia Piscivorous Bird EA (2003).

**Table 2.1. Avian Predation Deterrent Tools**

| Tools Currently In Use | Tools Available, But Not Currently Used |
|---|---|
| Visual Deterrents | Tactile Repellents |
| Auditory Deterrents | Chemosensory and Physiologic Repellents |
| Exclusion | Translocation |
| Shooting | Contraceptives |
| Habitat modification | Egg addling |
| | Avicides |

***Tools Currently in Use:***

To be effective, repellents/deterrents and other aversive strategies typically depend on irritation (pain), conditioning, or fear, and none is universally successful (Conover 1982). The use of a combination of repellents simultaneously is recommended, but does not always ensure successful deterrence (Bradley 1980). For birds, repellents can be visual, auditory, tactile, chemosensory, or physiologic. Of these five, visual and auditory deterrents are most practical and have been implemented at the dams.

*Visual Deterrents*

Visual deterrents scare or startle birds, causing them to leave the area. Examples of visual scare devices include balloons, kites, effigies, plastic flagging, and Mylar streamers. Functionally, visual repellents cause startle responses, as do aposematic colors (colors that are conspicuous and serve to warn such as orange, red, or silver) and cues associated with predators (e.g., hawk silhouettes, eyespots, raptor models). APHIS-WS has used a variety of visual devices, such as those mentioned above, with varying success. The startle responses (i.e., effectiveness) eventually diminish (often within days or a few weeks) as a function of several variables, including weather conditions, bird numbers, and the availability of nearby unprotected foods (Draulans and van Vessem 1985; Feare et al. 1986; Draulans 1987; Mason and Clark 1995).

Effigies are more practical at hatcheries than dams, where they have been employed with limited success (Cummings et al. 1986; Andelt et al. 1997). The use of gull wings to simulate dead floating gulls has been used to protect city reservoirs from loafing gulls and resultant nutrient loading (SWD 1996). In general, effigies are most effective when they are used to protect a small area, are moved frequently, alternated with other tools, and are well maintained.

A variety of light-emitting devices can be used to confuse, frighten, temporarily blind, and interfere with the activities of nocturnal predators such as the heron. Light-emitting devices left on continuously would not be practical and the majority of birds would quickly become accustomed to them. A radar-activated hazing system that incorporated acoustic alarm calls, pyrotechnics, and chemical repellents to deter waterfowl from contaminated ponds has been evaluated with positive short-term results. Low to moderately powered lasers have been tested as a non-lethal hazing device on various species of birds and show promising results as an effective tool for dispersing nocturnal piscivorous birds from hatchery facilities. Lights are not effective for reducing avian predation at dams and may instead attract predators. In one example, night releases of smolts (most smolts passed through the bypass system at night) into the tailrace area showed an approximate 50% increase in mortality over other releases (Sims and Johnsen 1977). Since the tailrace deck near the outfalls were well lighted, it was believed to have aided predators in capturing their prey. Jones et al. (1997) also observed gulls feeding at night in the forebay of dams that were illuminated by floodlights.

Mylar tape has been used with mixed results to reduce damage to fruit crops, sunflowers, millet, maize, and sorghum in the United States, Bangladesh, Philippines, and India (Bruggers et al. 1986; Dolbeer et al. 1986; Tobin et al. 1988). Mylar tape and other objects with shiny surfaces, by themselves, are ineffective for deterring piscivorous birds from dams. These objects are tied down, becoming a permanent feature for birds that habituate quickly. Success with this tool is often minimal or short-term, and completely ineffective at night. Mylar tape is used to enhance the visibility of the overhead wire exclusion system to birds, thereby reducing their risk of entanglement.

Avian hydrocannons have been installed at the juvenile bypass outfall at all of the Corps dams except The Dalles and Lower Granite. Hydrocannon systems consist of one or two 150-gpm irrigation-type impulse sprinklers powered by a submersible 25-hp three-stage electric turbine pump. The sprinklers are set to sweep a 50-yard radius with a 90-degree arc, centering on the juvenile bypass discharge plume (Jones et al. 1998). They typically run either 24 hours or dusk to dawn, and are operated during the juvenile fish season, although they may be operated at other times when juvenile fish predation is observed. Under ideal conditions, the avian hydrocannon covers a small percentage of most juvenile bypass outfall plumes, and gulls have occasionally been observed within the spray (Jones et al. 1998).

*Auditory Deterrents*

Birds will become accustomed to noises that are frequent, occur at regular intervals and intensities, and are broadcast in one location for long periods of time (Andelt and Hopper 1995; Curtis et al. 1996). Bomford and O'Brien (1990) evaluated the effectiveness of a variety of noisemakers on birds and mammals and concluded that their application is almost entirely limited to short-term control. However best effects are obtained when:

- Sound is presented at random intervals,
- A range of different sounds are used,
- The sound source is moved frequently,
- Sounds are supported by additional methods, such as distress calls or visual devices, and
- Sounds are reinforced by real danger, such as shooting.

Distress calls, automatic exploders, and pyrotechnic devices have been used with varying success to deter piscivorous birds from dams. The disadvantage of auditory repellents is the limited area of their effectiveness, particularly at dams, due to the width of the river and high levels of background noise. As with other techniques, noise-making devices generally are more effective when used in combination with other tools.

Distress and alarm calls have been relatively ineffective when applied as a hazing device. Alarm sounds may be superior to distress sounds for dispersing or repelling birds, assuming that valid alarm sounds exist for the species in question. At dams, the apparent ineffectiveness of these calls may be due to the overwhelming level of noise generated by water rushing under spill gates and elsewhere. An audio distress unit is in use at Little Goose.

Propane cannons have been commonly used for the control of bird depredation and nuisance problems. Some models of propane cannons vary the timing and number of blasts that are emitted and physically rotate to alter the direction of the blasts. This device is effective only when augmented with other tools, including limited lethal control, under the current program to reinforce the scaring property associated with each blast of the exploder (Slater 1980). Jones et al. (1996) found propane cannons to be only momentarily effective below hydroelectric dams, if at all, and on many occasions, birds showed no response. Great-blue herons have been observed using operational propane cannons as perches. Propane cannons are used at all of the dams, except Lower Monumental and Lower Granite.

Pyrotechnics are the primary hazing tool used to deter piscivorous birds at dams. Unlike distress calls or propane cannons, birds are less likely to habituate to pyrotechnics, which are used less frequently and only when birds are in the immediate vicinity. Various types of pyrotechnics used include: cracker shells, whistle bombs, screamers, screamer rockets, bangers, and fuse rope firecrackers. At aquaculture facilities in the southern United States, dispersal of night roosts was the most effective, non-lethal technique to temporarily deter cormorants. Although pyrotechnics are the most practical and efficient non-lethal noise-making device available, they are only marginally effective in deterring piscivorous birds from feeding at dams where long distances are common. Birds easily fly out-of-range and continue feeding. Jones (et al. 1997) also noted the limited range of pyrotechnics to disperse feeding gulls at The Dalles Dam. Birds also relocate to adjacent landowners' property. With landowner permission and proper agreements in place, hazing of avian predators, which are causing damage, may continue.

Ultrasonic devices have been offered as deterrents to roosting and loafing birds. These devices have no demonstrated utility, probably because birds are physiologically incapable of detecting ultrasound (Mason and Clark 1995).

*Exclusion*

In 1936, the USDA issued a leaflet with instructions and diagrams showing how to exclude birds from reservoirs and small fishponds. Since then, various types of exclusionary devices, from netting to stainless steel cable have been tested on various avian species to determine the optimal design. Exclusionary devices were developed for use at hatchery facilities. These devices were installed below hydroelectric dams on the Columbia and Snake Rivers. Table 2-2 provides a list of non-lethal equipment installed at the dams, and proposed improvements.

On the Lower Columbia and Snake Rivers, vast overhead wiring exclusion systems over the tailrace at each dam have been constructed and are actively maintained. These wiring systems consist of 3/64" stainless steel cable stretched from the one bank of the river to the other or from the shore to the dam, depending on the availability of suitable anchor points. The average exclusion system at hydroelectric dams is comprised of 21 to 30 wires spaced at 25 to 50 foot intervals, with wires stretching anywhere from 500 to 1,800 feet. Reflective mylar strands are installed on all the exclusion systems. The Bonneville strands are replaced annually (March, 2003).

**Table 2-2. Non-Lethal Equipment Installed and Proposed at Dams**

| Location | Type of Non-Lethal Equipment | Proposed Improvements |
|---|---|---|
| Bonneville | Exclusion systems with mylar flagging, 2 hydrocannons; propane cannon | None |
| The Dalles | Exclusion system with mylar flagging; propane cannon | None |
| John Day | Exclusion systems with mylar flagging; propane cannon | None |
| McNary | Exclusion system with mylar flagging; 1 hydrocannon; propane cannon; and nixalite | One additional hydrocannon |
| Ice Harbor | Exclusion system with mylar flagging; 1 hydrocannon; propane cannon; and nixalite | Nixalite on lights |
| Lower Monumental | Exclusion system with mylar flagging; 1 hydrocannon; and nixalite | Nixalite on lights, mooring dolphin and buoys |
| Little Goose | Exclusion system with mylar flagging; 1 hydrocannon; propane cannon; streamers in water; audio distress signals; and nixalite | One additional hydrocannon; Nixalite on lights and buoys |
| Lower Granite | Exclusion system with mylar flagging; and nixalite | One hydrocannon; Nixalite on lights and buoys. |

Strong winds have deteriorated the flagging at other dams. Generally, flags are replaced when replacement wires are installed. The wiring system at John Day was expanded in March of 2003 to include coverage for the juvenile bypass discharge area. The expansion eliminates the need for a hydrocannon at that location, unless the wires become damaged. See Appendix A for project exclusion systems and Table 2.3 below for additional details. Jones et al. (1996, 1997, 1998, 1999) discuss and illustrate the placement and effectiveness of an overhead wire exclusion system. In general, wire grids have been one of the most effective deterrents available, particularly for gulls, when used in combination with hazing and limited lethal control (under the current program).

Another form of exclusion is the use of Nixalite, which is the brand name for a device used to prevent birds landing on resting and loafing locations. Also known as porcupine wire, it is used in locations such as light standards, marker buoys, floating barrier logs or other prime predator bird resting locations. The objective is to cause them to rest further from the dams and increase their travel time to and from feeding

**Table 2.3. Dam Exclusion Systems Existing and Proposed Coverage**

| Location | Existing Area (acres) | Proposed Area increase (acres) | Purpose of Improvement |
|---|---|---|---|
| Bonneville Main Dam | 12 | Same | - |
| Bonneville Powerhouse 1 | 2.3 | Same | - |
| Bonneville Powerhouse 2 | 4.4 | Same | - |
| The Dalles Powerhouse | 18 | Same | - |
| The Dalles Spillway | 63 | Same | - |
| John Day | 90 | Same | - |
| McNary | 9.7 | 24 | Spillway tailrace area protection |
| Ice Harbor | 28.0 | 2.9 | Tailrace area protection |
| Lower Monumental | 4.1 | 9.3 | Spillway tailrace area protection |
| Little Goose | 3 | 9.7 | Spillway tailrace area protection |
| Lower Granite | 23.4 | Same | - |

sites near the dams. By excluding prime landing sites, avian predation near the dams becomes less efficient and requires more energy for the birds than alternate sites further from the dam. Porcupine wire has been used in a limited capacity at some of the dams and its use as a non-lethal deterrent is expected to continue and increase.

*Shooting:*

Under the current program, shooting is more effective as a dispersal technique than as a way to reduce bird densities when large numbers of birds are present. Shooting therefore also functions as a non-lethal tool (auditory repellant) for the birds that are not killed. Normally, shooting is conducted with shotguns. Shooting is an individual-specific tool and is normally used to remove a single bird and frighten away the other birds in a flock. This procedure reinforces the effectiveness of pyrotechnics, propane exploders, and other exclusionary devices. At hydroelectric dams on the Lower Columbia and Snake Rivers, lethal control alone under the current program is not effective in reducing avian predation because target birds must be in close proximity to the shore. As with pyrotechnics, flocks that are within range and are shot at often move further offshore and continue feeding.

Shooting is selective for target species but can be relatively labor intensive (USDA 1997, revised). Shooting with shotguns, air rifles, or rim and center-fire rifles is sometimes used to manage bird damage problems when lethal tools are determined to be appropriate. The birds are killed as quickly and humanely as possible. Firearms are used in accordance with applicable laws, regulations, and safety precautions.

To ensure safe use and awareness regarding the use of firearms, employees, who handle firearms and any other lethal control measures, must complete an approved firearms safety and use training course annually.

***Tools Available But Not Currently Used:***

*Repellents:*

Under conditions of normal use, repellents act directly on the target species but, importantly, they are non-lethal. Of the 43 products registered as bird damage control chemicals in the United, States, only seven are repellents (Mason and Clark 1995). Within this small group of products, capsaicin, denatonium saccharide, and napthalene are the active ingredients in three products. The other four contain the active polybutene, which is the only chemical that has demonstrated utility.

*Tactile Repellents*

Tactile chemicals are derived from petroleum or coal and are usually used to discourage birds from alighting or roosting on structures and trees. One such chemical, polybutene, is a chemically inert wax emulsion and has excellent moisture and barrier qualities. It can be mixed with water to form an emulsion, and is applied to hard surfaces. It does not dissolve in water, and would float on water when not suspended. Many grades have FDA clearance. The material can be applied to beams, posts, and other structural materials in order to deter gulls and other birds from landing by modifying the perching surface so that it becomes slippery or sticky, confusing a bird's tactile senses or physically preventing perching (Schafer 1991). While effective, polybutene-based repellents are thermally unstable, and melting repellent can deface structures to which it is applied (Mason and Clark 1995). Although polybutene is not considered to be directly toxic, secondary effects are death by exposure or starvation when excessive feather contamination interferes with thermoregulatory ability or flight (Schafer 1991).

*Chemosensory and Physiologic Repellents*

These substances are effective either because they are painful or cause sickness (Mason and Clark 1995). Although a product for this tool is not currently available for implementation, research is being conducted on methyl anthranilate (MA), a product that has shown some efficacy in repelling gulls from shallow pools of water used for loafing and watering, but has been shown to have no effect on the time herons spent handling fish. MA is not fundamentally toxic to mammals or birds, but may be moderately toxic to fish. The potential use of chemical repellents in deterring feeding birds from dam and hatchery facilities is limited under current technology and none are registered with the Environmental Protection Agency (EPA) or Food and Drug Administration (FDA) for this use. If these types of repellents were used in the future, additional analysis and coordination, such as for the Clean Water Act and the Endangered Species Act, would occur.

*Alternative Food Plots*

An alternative food plot is providing an alternative source of food in alternative location. The use of alternative food plots and their potential effectiveness to dissuade avian predation below hydroelectric dams has not been demonstrated at this time.

*Habitat Modification*:

The Basinwide Salmon Recovery Strategy (Federal Caucus 2000) calls for modifying abundance and distribution of predators by altering their habitat. Habitat modification is an integral part of wildlife damage management. The type, quality, and quantity of habitat are directly related to the wildlife that is produced. Most off-site habitat management to reduce piscivorous bird usage directly on-site at dams is not practical. The modification of habitat at hydroelectric dams that included the re-design or removal of dams or hatcheries has been considered in multiple EIS's (Corps et al. 1995; NMFS 2000b; BPA 2001; Corps et al. 2002a).

Habitat modification of nesting colonies where birds have been shown to use hydroelectric dams as a feeding area is being considered. Habitat modification is the best long-term, most ecologically sound and socially acceptable solution for reducing nesting gull populations (Blokpoel and Tessier 1986) and has been an effective tool for reducing nesting Caspian terns on Rice Island in the Columbia River estuary (Collis et al. 2001). A 70m x 70m visual barrier made of woven black polypropylene fabric (silt fencing) was tested to discourage gull nesting on Upper Nelson Island, located on the Columbia River near the city of Richland, WA. Although this tool was labor intensive (147 person hours over 3 days) and somewhat costly ($1.81/m), the zone with fencing had 84% fewer nests than the control zone.

Caspian tern habitat modification work has been performed on Rice Island, downstream of Bonneville Dam, but not under the Corps APD Program. As the tern colony continues to increase in the estuary, it was successfully relocated from Rice Island to East Sand Island, where the birds now feed on more ocean-type fish and less on salmonids. See Appendix A Plate 2 for island locations. This effort is discussed in further detail in Chapter 6 Cumulative Effects.

Crescent Island is Federal property, administered by the Corps and currently leased to USFWS. The island was created from dredge spoils and is located on the Columbia River, upstream of McNary Dam, between its confluences with the Walla Walla and Snake Rivers. The number of Caspian terns nesting and residing at Crescent Island has increased in the past few years. Any habitat modification efforts proposed would be evaluated and separate NEPA documentation would be prepared, as necessary.

*Translocation:*

The trapping and translocation of piscivorous birds is generally not a practical option. Birds typically have a better homing instinct than mammals and because of this, translocation is not commonly used to solve bird problems (Conover 2001). However, the natural translocation of piscivorous bird colonies through habitat modification may be an acceptable non-lethal alternative.

*Contraceptives*:

Contraceptives have not proven to be an effective tool for reducing damage, and there are no contraceptive drugs registered with the FDA for piscivorous bird use. The Corps will continue to evaluate research, but has no plans to use contraceptive tools at this time.

*Egg addling:*

Egg addling/destruction is the practice of destroying the embryo prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times, which causes detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways, but the most commonly used tools are manually gathering eggs and breaking them, or by oiling or spraying the eggs with food grade oil which prevents gas passage through the shell and prevents the embryo from obtaining oxygen. Although egg addling or destruction has not commonly been used for the protection of juvenile salmonids, it could be a useful damage management tool and has shown to be effective at reducing egg hatchability (USDA 2001, 2003). This is not a tool that the Corps would expect to use, as few or no nesting areas are located on-site at the dams.

*Avicides*:

Avicides are regulated and administered by the EPA and the Washington and Oregon Departments of Agriculture. DRC-1339 is a slow acting avicide that is currently registered with the EPA for reducing damage by California, ring-billed, and herring gull species. No other avicides are registered for piscivorous bird species. DRC-1339 is highly toxic to sensitive species, such as gulls, blackbirds, pigeons, and crows, but only slightly toxic to non-sensitive birds, raptors and mammals. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and ESA-listed species. Aquatic and invertebrate toxicity is also low. The half-life of DRC-1339 is about 25 hours and degradation occurs rapidly in water.

During the breeding season, sensitive target species may be controlled in their colonies for the purpose of protecting other colonially nesting species and to reduce populations of target gulls which damage property or crops in other areas. At any time of the year, these species may be controlled at their feeding sites at airports, industrial areas, landfills, or other non-crop areas throughout the year. Personnel using chemical methods require certification as pesticide applicators by the Department of Agriculture in Washington and Oregon States (WSDA and OSDA) and are required to adhere to all certification requirements set forth in the Federal Insecticide, Fungicide, and Rodentcide Act (FIFRA). Currently, avicides are not applicable, practical, or effective, and are not a foreseeable action, but is described in this section for information.

## 2.2 Alternative 2: Non-Lethal Tools Only

Alternative 2 is the Current Program Alternative without the use of lethal direct control. Both technical assistance and direct control would be provided in the context of a modified IWDM approach. The Corps would only use non-lethal strategies to resolve piscivorous bird damage situations. Lethal control could be used, under certain circumstances by other permitted agencies. The Corps would still use the APHIS-WS Decision Model to determine the best approach for resolving wildlife damage, but lethal tools would be administratively screened from consideration in formulating control strategies. Examples of non-lethal tools (exclusion systems, hydrocannons, etc.) for controlling damage caused by various bird species are described in Appendix J of the USDA-APHIS ADC Programmatic EIS (1997, revised), and in Section 2.1 of this EA. The use of non-lethal tools could result in local population increases and could result in impacts to adjacent landowners.

## 2.3 Alternative 3: Exhaust All Non-Lethal Tools First

Alternative 3 differs from the Current Program in that the Current Program recognizes non-lethal tools as an important dimension of IWDM, gives them first consideration in the formulation of each control strategy, and recommends or uses them when practical and effective before recommending or using lethal tools. In contrast, Alternative 3 requires that all non-lethal tools be implemented, regardless of practicality, effectiveness, or biological, social, and economic consequences, before any lethal tools are recommended or used. Under Alternative 3, any non-lethal tool that may reduce avian predation would be used before any lethal tools could be implemented. The delayed use of non-lethal tools could result in local population increases and could result in impacts to adjacent landowners.

## 2.4 Alternative 4: No Corps Program

Alternative 4 would consist of the Corps taking no actions to reduce piscivorous bird damage at its Lower Columbia and Snake River dams. It is assumed that avian predator presence and activity would increase in areas near the dams where juvenile salmonids are susceptible. Consequently avian predation on juvenile salmonids would likely increase. The NMFS 2000 BiOp RPA action 101 would not be effectively implemented to minimize and mitigate impacts to Federally-listed salmonids to the ‘maximum extent practicable’ as required by the ESA (NMFS 2000b). The Corps’ compliance with RPA 101 would be in question, if not determined non-compliant. This alternative would not meet the program’s purpose and need.

## 2.5. Alternative 5: Lethal Tools Only

Alternative 5 would use only lethal methods to deter piscivorous birds from preying on juvenile salmonids and would not use a damage management system. It would not employ non-lethal methods that have been proven effective at deterring avian predation, which would include removing existing exclusionary systems from all of the dams. This alternative is considered environmentally unacceptable because its sole means of discouraging avian predation would be through lethal take. The alternative would meet the program’s purpose and need, but would fail to manage damage to target species. Wildlife agencies have stated that lethal tools are only to be used as a supplement to non-lethal tools. Increasing the take level of target species could reduce local populations and decrease viewing opportunities in adjacent areas. This alternative is is considered environmentally unacceptable.

## 2.6. Screening of Alternatives

Alternatives that are not viable alternatives will be excluded from further evaluation. The provided discussion below identifies the rationale used for screening and excluding these alternatives.

**Alternative 4: No Corps Program**
This alternative is eliminated because it would not meet the program’s purpose and need.

**Alternative 5: Lethal Tools Only**
This alternative is eliminated because it does not constructively manage damage to target species.

## 2.7. Alternatives Carried Forward

The following alternatives were not screened out, and will be carried forward for further analysis and evaluation in Chapter 4.

Alternative 1: No-Action (No Change) Current Program
Alternative 2: Non-Lethal Tools Only
Alternative 3: Exhaust All Non-Lethal Tools First

# 3.0 EXISTING ENVIRONMENT

### 3.0.1 Resources with Minimal or No Impact

The actions discussed in this EA involve minimal ground disturbance or construction. Therefore, the following resource values are either not affected, or are expected to be minimally affected by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetland, air quality, prime and unique farmlands, vegetation, aesthetics/visual quality, transportation, cultural/historic resources and/or utilities. Except for avian predators and anadromous fish, the proposed APD program does not affect other aquatic and wildlife resources. These resources will not be discussed further.

## 3.1 Recreation

Recreational viewing of wildlife is available to the public from the dams. Most visitors to the dams are interested in viewing aquatic species, such as salmon and steelhead. Recreational activities are also conducted on the reservoirs behind the dams and on the river sections downstream of the dams. Areas immediately upstream and downstream of the dams are restricted areas from public use due to concerns for safety. The APD program is primarily performed in these restricted areas. However, the blasts from shotguns or propane cannons can produce noise that may be heard outside of the restricted areas which visitors may find distracting or disturbing.

## 3.2 Aquatic and Wildlife Resources

The following section discusses existing aquatic and wildlife resources that exist at the project sites. Birds, fish, mammals, trees and plants are found in abundance within and adjacent to the project area. The proposed APD program does not affect many of these resources and therefore, this section will focus on describing only those resources that are primarily affected, specifically avian predators and anadromous fish. The Biological Assessment (BA) (Appendix C) addresses species listed as threatened or endangered under ESA that reside in proximity to the Corps dams,. The BA determines the program's expected level of affect on those species.

### 3.2.1 Brief history of juvenile salmonid predation and mitigation

Hydroelectric development changed the Columbia River basin from mostly free-flowing rivers beginning in 1933 to a series of dams and impoundments by 1975. The reservoirs that formed behind some dams created islands that were ideal for piscivorous bird colonization (NMFS 2000b). Enhancement measures to offset dam-related mortality of fish included increased numbers of smolts released from hatcheries, spillway deflectors to reduce total dissolved gas (TDG) supersaturation, juvenile fish bypasses at dams, transportation of smolts around dams, supplemental river flows to minimize delay for smolts passing through reservoirs, and spilling water to bypass juvenile fish. Guidance systems such as surface bypass and collection structures, submersible screens, and behavioral guidance structures have helped direct smolts through the upper part of the water column, where they prefer to swim, thus avoiding the turbines in the dam.

The major causes of mortality of migrating juvenile salmonids in the Columbia River basin have been identified as passage through the turbines, TDG supersaturated water due to spill, migration delays, fish disease, and predation by birds and fishes in the reservoir, forebay and tailrace; (CORPS et al. 1995; Federal Caucus 2000; NMFS 2000b; BPA 2001; NMFS 2002; CORPS et al. 2002a). Piscivorous birds often feed in areas of high fish density and attract other birds to feeding areas. In the Columbia River basin, piscivorous birds aggregate below hydroelectric dams in spring to feed on emigrating juvenile salmonids (Jones et al. 1996, 1997, 1998, 1999; NMFS 2000b). Juvenile salmonids commonly experience a number of stressful events or conditions during their seaward migration. Most of these events occur serially and can have cumulative effects, as when juvenile salmon pass through dams and enter predator-inhabited tailrace areas (Mesa 1994). Because dam passage is a stressful event (Specker and Schreck 1980; Matthews et al. 1986; Maule et al. 1988; Abernethy et al. 2001), there is concern that juvenile salmonids passing through dams would not be able to cope with subsequent stressors, such as predators (Mesa 1994).

The Basinwide Salmon Recovery Strategy (Federal Caucus 2000) outlines measures to identify and address mortality factors in the mainstem reservoirs, which are a significant component of the overall goal to increase the survival of juvenile salmonids. Actions include hydropower operations, predator management, and habitat modifications that may reduce the effect of predators on juvenile salmonids. The Federal Caucus (2000) states that research and evaluation of passage survival through dams and reservoirs will continue, with emphasis on the effect of passage delay in the forebay and tailrace at dams and the relationship between dam passage and reservoir mortality. Measures planned to improve juvenile survival include:

- Increased flow augmentation for summer migrants, particularly in the low water years,
- Management of reservoir and run-of-river projects to reduce extreme water level fluctuations,
- Management of predator populations (fish, birds, and mammals), and
- Implement passage measures which move fish quickly through the forebay and tailrace of dams

The implementation of APD management activities to reduce predation on ESA-listed juvenile salmonids is but one of many mitigative measures. Given the state of decline being faced by many salmon and steelhead species, APD management could contribute to recovery efforts along with a suite of other management actions (Federal Caucus 2000).

### 3.2.2 Predation at hydroelectric dams

The area immediately below dams where smolts are most vulnerable to predation is called the tailrace, which extends 1,000 feet downstream from the base of the dam. Avian predation in the tailrace of each dam should be reduced in order to allow time for disoriented smolts to recover from the physiological effects of dam passage. The physiological condition of migrating juvenile salmonids may be altered by dam passage or transportation, increasing their vulnerability to avian predators (Maule et al. 1988; Federal Caucus 2000; NMFS 2000b; NMFS 2002).

Juvenile salmonids may experience various levels of gas bubble trauma (GBT) due to TDG supersaturated water as they enter the tailrace of the dam. When air is dissolved in water at pressures exceeding one atmosphere, more gas is driven into solution than is normal for most surface waters; such waters are supersaturated. Studies have been conducted documenting the level of GBT experienced by anadromous fish during dam passage and its possible effect on predator avoidance (Mesa 1994; Mesa et al. 2000; Abernethy et al. 2001). When aquatic animals, especially fish, are exposed to water containing gas levels over 110%, they may be injured or killed by air emboli collecting in vital organs. In lab tests, prey subjected to multiple agitations (simulating conditions encountered by smolts during dam passage) were lethargic, frequently disoriented, and occasionally injured, but they never died during or immediately after the stressor treatments; data revealed that smolts stressed by agitation were eaten (by northern pikeminnow) in significantly greater numbers than control fish. Abernethy et al. (2001) noted that although test fish fully recovered from simulated dam-passage tests, temporarily stunned fish may be more susceptible to predators in the tailwaters of a hydroelectric dam. Smolts became progressively more alert and active with passing time, usually within 3 hours after the final stress.

### 3.2.3 Juvenile salmonid protection

Anadromous salmonid ESUs in the Lower Columbia and Snake River basins have been listed under the ESA (NMFS 2000b). The risk of extinction for these ESUs has prompted a major allocation of resources toward restoring freshwater *habitats*, enhancing passage though the *hydrosystem*, restricting *harvest*, and improving *hatchery* production, also known as the *all-Hs* of salmon restoration (Federal Caucus 2000). Increasing attention has focused on losses of emigrating smolts to avian predators as one of many measures to enhance passage through the hydrosystem (Jones et al. 1996, 1997; 1998; 1999; Collis et al. 2001).

Factors affecting the intensity of this predation include life history characteristics of the migrating stocks, concentration of juveniles at dams, stunned or disoriented juveniles at turbine and spillway discharges, limnological changes after impoundment, and changes in the predator complex. The relative effect of different vertebrate predators is rarely quantified, which has led to continued disagreement about the extent of damage attributable to birds or mammals.

NMFS (2000b) has identified gulls as significant predators of juvenile salmonids. Gulls are the primary avian predators at Corps hydroelectric dams (Jones et al. 1997, 1998, 1999; NMFS 2000b) and take a minimum of tens of thousands of migrating smolts every year (Jones et al. 1998). The impact of gull predation below a single dam may seem insignificant, but the combined effect of predation on salmon survival at each of the nine Columbia River dams and four Snake River dams is substantial, especially in combination with other negative impacts such as turbines, nitrogen supersaturation, migration delays, and disease.

Avian deterrent wires, the primary non-lethal damage management tool used below each hydroelectric dam, have been proven to reduce the accessibility of juvenile salmonids to avian predators (Jones et al. 1996, 1997, 1998, and 1999), but only when used in combination with limited lethal control (see Section 2.1). The effectiveness of passive exclusionary devices below dams in Columbia River Basin would be severely reduced without limited lethal removal of individual birds. Collis et al. (2002a) observed that the current practice of protecting smolts from gull predation in areas where they have been shown to be vulnerable (i.e. dams) is likely to be the most effective tool to minimize the impacts of predation on survival of juvenile salmonids.

Searing et al. (2002) assessed the piscivorous bird predation from Rock Island Dam through Hanford Reach. The results indicated that the combined predation on juvenile salmonids by gulls, grebes, cormorants, and mergansers had the potential to comprise the vast majority of avian-caused smolt mortality. Smolts were consumed by gulls during the study period, leading to a mortality rate of 1 to 2% of ESA-listed and non-listed juvenile salmonids. Observations made by Searing near Wanapum and Priest Rapids Dams suggested that shooting gulls and other avian predators was an effective means of reducing the number of birds feeding in the tailrace. On days when APHIS-WS was not working, gulls were commonly seen foraging on smolts in the tailraces (Searing et al. 2002).

Demachi et al. (2003) assessed the amount of avian predation on migrating smolts during various spill configurations and the behavior of the birds consuming smolts at Wanapum and Priest Rapids Dams on the Mid-Columbia River. The study's objective was to determine practical and effective bird damage management strategies that could be used to reduce avian predation rates. Observations indicated that 92% of the fish taken by gulls were alive; however, while some of the fish may have died anyway or were in the process of dying, a considerable portion were likely healthy prior to being taken. It was also concluded that spill type alone was not an effective means of mitigating avian predation; whereas the APHIS-WS implementation of an integrated program effectively reduced bird abundance, and predation on smolts (Demarchi et al. 2003).

Columbia Bird Research (2002, Weekly Report) observed piscivorous birds to be 2-3 times higher at McNary Dam on the Lower Columbia River when APHIS-WS personnel were not conducting direct control activities. Similarly, the number of foraging attempts by gulls in the tailraces was roughly 6 times higher without direct control activities (42.2 attempts per hour), as compared to with-direct control activities (7.7 attempts per hour). However, the success rate of the gulls, with and without APHIS activity, did not vary and was roughly 50% (i.e. even when there were fewer birds and less competition, their success rate did not improve) (Columbia Bird Research 2002).

The exact number of juvenile salmonids consumed below dams is difficult to determine, but minimum estimations of piscivorous predation rates have been estimated based on PIT-tag data (passive integrated transponder) and bioenergetics models. According to Murphy (2002), the rates of piscivorous bird predation are considered minimum estimations because:

(1) PIT-tags are consumed and defecated or regurgitated by piscivorous birds en route to or away from the colony sites that are surveyed each year and are never located;
(2) Tags may be buried too deeply in the sand to be detected by electronic equipment, or may be carried away by water and wind;
(3) Tags may not be detected by portable PIT-tag readers when they are in close proximity to each other and;
(4) Some PIT-tags that become damaged can no longer be read by electronic equipment.

Natural selection governs the time of production in such a way that it takes place when the food supply for the young is most plentiful. Steelhead and salmon smolt migration begins in early April from the upper portions of the Columbia and Snake Rivers. The timing of this migration corresponds with the initiation of piscivorous bird nesting throughout the Columbia River basin (Collis et al. 2001).

Although no one has defined the exact number of ESA-listed anadromous fish being consumed by avian predators on the Lower Columbia and Snake Rivers, it has been demonstrated that a certain percent are consumed below each hydroelectric dam. Conover (2001) states that there is no word or phrase to describe species whose current population exceeds historical levels due to human caused environmental changes; hence these species are referred to as being "anthropogenic abundant." Many environmental changes caused by humans either simply cannot be reversed or the cost of doing so would be too high. In these cases, other approaches are needed to reduce the environmental harm caused by anthropogenic abundant species, and one such approach is to reduce populations of those species when they threaten an endangered species or pose a danger to the environment (Conover 2001). Modes of managing animal damage include a variety of ecological approaches that apply the same population ecology principles as those to enhance positively valued wildlife. No single activity is sufficient to recover and rebuild fish and wildlife species in the Columbia River basin, but rather the successful protection, mitigation, and recovery effort must involve a broad range of strategies, including habitat protection and improvement, hydrosystem reform, artificial production, and harvest management (NPPC 2000).

### 3.2.4 Predator Control Data

The Corps, NMFS, USFWS, NPPC, and others have identified that predator control is likely to increase smolt survival through each project on the Lower Columbia and Snake Rivers.

### Gulls

California gull:
During the 5-year period (FY1997 to FY2001), 16, 721 California gulls were hazed and 1,622 were lethally removed at all Corps projects on the Lower Columbia and Snake Rivers. The average per year was 3,344 and 324, respectively (USDA Management Information System (MIS) 1996-2001). This represents a total hazed to killed ratio of 10.3 to 1. Hazing and kill data for the year FY2002 was 16,119 and 94, respectively (see Appendix G). USDA (2001) also discusses the impacts of wildlife damage management activities on this species in Washington. Figure 3.1 shows the percentage of birds killed vs. hazed. The increase in take in FY2001 is most likely attributed to increased colony populations and increased usage of the tailrace areas. The most hazing occurred in FY2002.

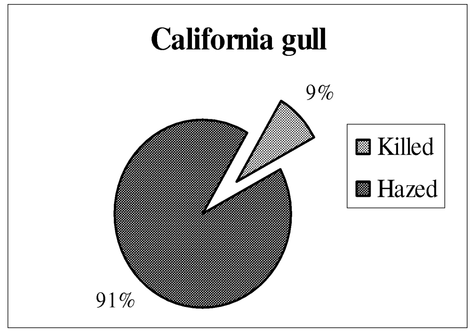



**Figure 3.1:** Percentage of California gulls killed vs. hazed at all CORPS dams on the Lower Columbia and Lower Snake Rivers.

Ring-billed gull:
During the 5-year period (1997 to 2001), 66,852 ring-billed gulls were hazed and 4,947 were lethally removed at all Corps projects on the Lower Columbia and Snake Rivers. The average per year was 13,370 and 989, respectively (USDA MIS 1996-2001). This represents a total hazed to killed ratio of 13.5 to 1. Hazing and kill data for the year 2002 was 29,488 and 530, respectively (see Appendix G). USDA (2001) also discusses the impacts of wildlife damage management activities on this species in Washington. Figure 3.2 shows the percentage of birds killed vs. hazed. The lethal take peaked in 1999 and decreased during each of the following years. The most hazing occurred in 2002.

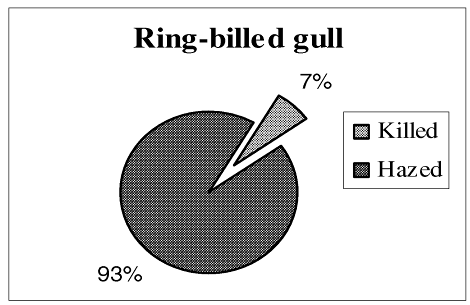



**Figure 3.2:** Percentage of ring-billed gulls killed vs. hazed at all Corps dams on the Lower Columbia and Lower Snake Rivers.

Herring gull:
During the 5-year period (1997 to 2001), 1,411 herring gulls were hazed and 161 were lethally removed at all Corps projects on the Lower Columbia and Snake Rivers. The average per year was 282 and 32, respectively (USDA MIS 1996-2001). This represents a total hazed to killed ratio of 8.8 to 1. Hazing and kill data for the year 2002 was 2,767 and 48, respectively (see Appendix G). USDA (2001) also discusses the impacts of wildlife damage management activities on this species in Washington. Figure 3.3 shows the percentage of birds killed vs. hazed. The lethal take peaked in 2000 and was reduced in 2001 and 2002. The most hazing occurred in 2002.

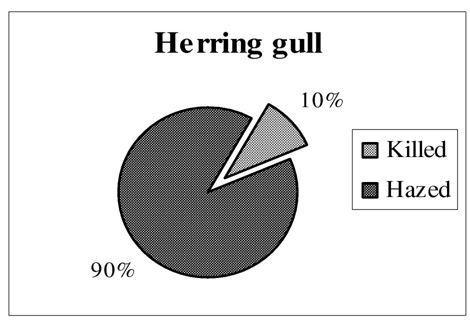



**Figure 3.3:** Percentage of herring gulls killed vs. hazed at all Corps dams on the Lower Columbia and Lower Snake Rivers.

Unidentified gulls:
During a 2-year period (1997 and 1998), an additional 24,578 unidentified gulls were hazed and 3,275 were lethally removed at all Corps projects on the Lower Columbia and Snake Rivers (USDA MIS 1996-2001). The total hazed to killed ratio for all gulls during the 5-year period is 11 to 1.

### Double-crested Cormorants

During the 5-year period (1997 to 2001), 13,278 double-crested cormorants were hazed and 890 were lethally removed at all Corps projects on the Lower Columbia and Snake Rivers. The average per year was 2,656, and 178, respectively (USDA MIS 1996-2001). This represents a total hazed to killed ratio of 14.9 to 1. Hazing and kill data for the year 2002 was 7,583 and 6, respectively (see Appendix G). USDA (2001) also discusses the impacts of wildlife damage management activities on this species in Washington. Figure 3.4 shows the percentage of birds killed vs. hazed. The lethal take peaked in 1999 and decreased during each of the following years. The most hazing occurred in 2002.

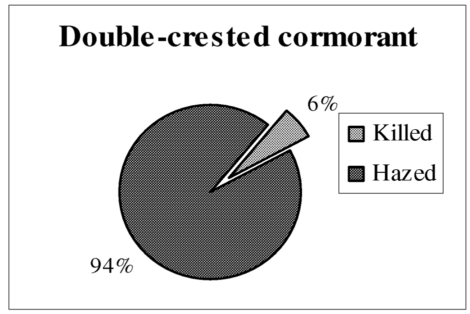



**Figure 3.4:** Percentage double-crested cormorants killed vs. hazed at all Corps dams on the Lower Columbia and Lower Snake Rivers.

The Double-crested Cormorant Final EIS (64 FR 60826; USFWS 2001) assesses various alternatives for managing increasing populations of double-crested cormorants throughout the nation. The need for action is based upon the correlation between increasing populations and the growing concern about associated negative impacts, thus creating a substantial management need to address those concerns. These concerns include impacts to other bird species through habitat destruction, exclusion, and/or nest competition; declines in fish population associated with double-crested cormorant predation; impacts to vegetation; and impacts to populations of ESA-listed fish species. The USFWS EIS does not specifically take into account the growing populations of double-crested cormorants in eastern Washington.

### Western Grebe

Western grebe are identified as a secondary predator as they do not occur at the dams in great numbers. During the 5-year period (1997 to 2001), 3,426 western grebe were hazed and 258 were lethally removed at all Corps projects on the Lower Columbia and Snake Rivers. The average per year was 685 and 52, respectively (USDA MIS 1996-2001). This represents a total hazed to killed ratio of 13.3 to 1. Hazing and kill data for unidentified grebe in the year 2002 was 823 and 15, respectively (Appendix G). USDA (2001) also discusses the impacts of wildlife damage management activities on this species in Washington. Figure 3.5 shows the percentage of birds killed vs. hazed. The lethal take peaked in 1999. The most hazing occurred in

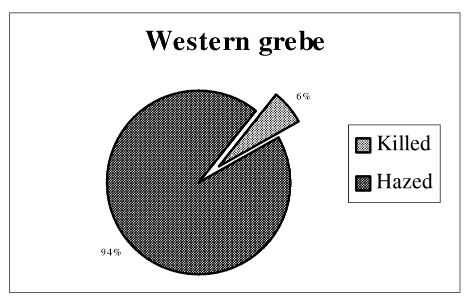



**Figure 3.5:** Percentage of western grebe killed vs. hazed at all Corps dams on the Lower Columbia and Lower Snake Rivers.

2000.  Western grebe are able to enter interior dam spaces by diving and entering through underwater passages.  Oftentimes these birds die because they cannot be captured and are not able to escape.

**Other Avian Predators**

Other avian predators include the remainder of the secondary predator species identified in Table 1.2.  These include Caspian terns, common mergansers, American white pelicans, great-blue herons, and belted kingfishers.  In most cases, these species are only hazed and not killed.  The only exceptions are seven great blue herons that were taken in 1998, and one common merganser taken in 1997.

# 4.0 ENVIRONMENTAL EFFECTS

## 4.0.1 Method of Analysis

In the development of this EA, the following issues were identified for evaluation: biological, economic, socio-cultural, and physical impacts. This section analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis. The environmental consequences of each alternative are evaluated to determine if the potential impacts would cause a significant adverse effect. A summary of the alternatives and the environmental affects are compared in Table 4.1.

**Table 4.1. Comparison of Alternatives and Environmental Consequences**

| | **Alternative 1 No Action (Current Program)** | **Alternative 2 Non-Lethal Tools Only** | **Alternative 3 Exhaust All Non-Lethal Tools First** |
|---|---|---|---|
| **Relative effectiveness of control tools in reducing or minimizing damage to ESA-listed species** | 4.1.1 The program has been relatively effective in the past and would be expected to be the most effective and cost-effective alternative. No significant impact for target or secondary species. | 4.2.1 Decreased relative effectiveness and increased program costs when compare to Current Program | 4.3.1 Decreased relative effectiveness and increased program costs when compare to the Current Program |
| **Impact on ESA-listed fish species and non-target avian predators** | 4.1.2 Non-target species - no negative impacts observed.<br><br>T&E salmonid species – beneficial effect | 4.2.2 Non-target species – same as Current Program.<br><br>T&E salmonid species – potential for reduced beneficial effect | 4.3.2 Non-target species - – same as Current Program.<br><br>T&E salmonid species – potential for reduced beneficial effect |
| **Impact on avian predator populations** | 4.1.3 Gulls – LOW and MODERATE overall impact rating<br>Cormorants - LOW overall impact rating<br>Secondary predators – LOW overall impact rating | 4.2.3 Same as Current Program | 4.3.3 Same as Current Program |
| **Humaneness of control tools** | 4.1.4 Minimal concern and no significant impact | 4.2.4 Same as Current Program | 4.3.4 Same as Current Program |
| **Impact on recreational and aesthetic opportunities** | 4.1.5 Minimal concern and no significant impact | 4.2.5 Same as Current Program | 4.3.5 Same as Current Program |

A methodology to evaluate and determine whether or not biological impacts are significant was needed. Methodology established by the APHIS-WS Programmatic EIS (USDA 1997, revised) was evaluated and is included in this analysis. The method of considers the following evaluation factors:

- magnitude
- geographic extent
- frequency or duration
- likelihood of impact

Where a quantitative or qualitative evaluation is possible, specific criteria for the magnitude, geographic extent, duration and frequency, and likelihood of impacts are used for each of the major target species. This evaluation process is used to determine the significance of the impacts pursuant to Council on Environmental Quality (CEQ) regulations (40 CFR 1508.27). To determine the significance of an impact, all four of the evaluation factors must be considered together. Table 4.2 presents the entire range of possible evaluation factor combinations for determining the NEPA significance of adverse biological impacts.

**Table 4.2. Criteria for Determining Significant Adverse Biological Impacts**

| | **Biological Impact Evaluation Factors** | | | |
|---|---|---|---|---|
| **Impact Rating** | **Magnitude** | **Geographic Extent** | **Duration & Frequency** | **Likelihood** |
| **Significant** (as defined by NEPA) | High | Moderate or High | Any Level | High |
| | High | Moderate or High | High | Moderate |
| **Moderate** | High | Any Level | Moderate or Low | Moderate |
| | High | Low | Any Level | High |
| | High | Any Level | Any Level | Low |
| | Moderate | Any Level | Any Level | Any Level |
| | Low | High | High | High |
| **Low** | Low | Moderate or Low | Any Level | High |
| | Low | Any Level | Any Level | Moderate or Low |

The *magnitude* of an impact reflects relative size or amount of an impact. The *geographic extent* of an impact considers how widespread the program impact might be. The *duration and frequency* of an impact (whether the impact is a one-time event, intermittent, or chronic) also helps define the limits. The *likelihood* of an impact (whether the impact is likely to occur) is the final evaluation factor. A more in-depth description of each of the evaluation factors is provided in the following text.

A summary of the evaluation factor determinations for the Current Program, for each species, is provided in Table 4.3. The information in the table is discussed and determined in the following sections.

**Table 4.3. Evaluation Factors and Overall Impact Rating Summary by Species for the Current Program**

| Species | Magnitude | Geographic Extent | Duration & Frequency | Likelihood | Overall Impact Rating |
|---|---|---|---|---|---|
| California Gull | Low | Low | High | High | Low |
| Ring-billed Gull | Low | Low | High | High | Low |
| Herring Gull | Low | Low | High | High | Low |
| Double-crested Cormorant | Low | Low | High | High | Low |
| Secondary Predators | varies | Low | High | Low | Low |

#### 4.0.1.1 Magnitude

The magnitude of an impact reflects relative size or amount of an impact. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. In this analysis, magnitude is evaluated first in terms of total take (number of individuals killed), then in terms of the APHIS-WS program. Magnitude evaluations for each of the five primary predator species are limited to Washington State. The procedures for determining magnitude are detailed in Figure 4.1.

Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable take levels, and actual take data. The Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, and USFWS do not currently have quantitative data on bird species discussed in this EA. None of these species are managed for recreational purposes. Qualitative determinations are based on population trends and take data when available. This EA will use qualitative data because quantitative data do not exist. Appendix G Table1 present the numbers of birds killed and hazed, by species, as a result of the need for avian predation deterrence management on the Lower Columbia and Snake Rivers between FY 1997-2002.

Magnitude is considered along with ratings for geographic extent, duration and frequency, and likelihood to determine NEPA significance of the program for each of the five primary predator species analyzed in detail in this EA.

**Criteria for Qualitative Determinations**

When an allowable take level, established by USFWS, is not available, the magnitude rating for total take is based solely on State and regional population trends. The use of population trends as an index of magnitude is based on the assumption that the annual Depredation Permit Take does not exceed allowable take levels. The criteria for rating total Depredation Permit Take magnitude on the basis of bird population trends are as follows:

- If the population trend is increasing, the magnitude is considered low.
- If the population trend is stable, the magnitude is considered moderate.

- If the population trend is decreasing, the magnitude is considered high.

For purposes of this analysis, when a State or region reports overlapping population trends (e.g. increasing or stable, stable or decreasing), magnitude ratings are based on the most conservative trend. For example, a trend reported as increasing or stable translates to a magnitude rating of moderate. Magnitude determinations are not made when information on population numbers or trends are unavailable.

The APHIS-WS program kill magnitude is rated only for the species where total Depredation Permit take magnitude is rated (i.e. a population trend estimate is available). APHIS-WS kill magnitude is based on the fraction of total Depredation Permit take attributed to APHIS-WS program activities. Magnitude ratings for the APHIS-WS kill are based on the following criteria-

- If APHIS-WS kill is less than or equal to 33 percent of the total Depredation Permit take, the magnitude is considered low.
- If APHIS-WS kill is greater than 33 percent but less than or equal to 66 percent of the total Depredation Permit take, the magnitude is considered moderate if population trend is decreasing, or low if the population trend stable or increasing.
- If APHIS-WS kill is greater than 66 percent of the total Depredation Permit take, the magnitude is considered equivalent to the Population Trend rating.

The APHIS-WS kill magnitude cannot exceed the population trend rating because the APHIS-WS take is only a portion of the total take. APHIS-WS kill magnitude and total Depredation Permit take magnitude are equal when the APHIS-WS take constitutes more than 66 percent of the total depredation take. APHIS's take of piscivorous birds for the Corps usually constitutes more than 66% of all reported take authorized by USFWS.

#### 4.0.1.2 Geographic extent

The geographic extent of an impact considers how widespread the program impact might be. Geographic extent of the program impact is determined by the percentage of the Lower Columbia and Snake Rivers where APD program management is implemented. For the purpose of this analysis, the Lower Columbia and Snake Rivers region is defined as the area stretching from the barge discharge location near Columbia RM 140, to the confluence of the Snake and Columbia Rivers (approximately Columbia RM 324), and on the Lower Snake River from RM zero to one mile upstream of Lower Granite Dam (Snake RM 108). Altogether, this area comprises approximately 202 river miles. Activities are conducted at site-specific locations around each dam site, but for the purpose of this analysis these activities are considered to occur within one mile of each dam. For purposes of this EA, the geographic extent of the program take is divided into three levels.

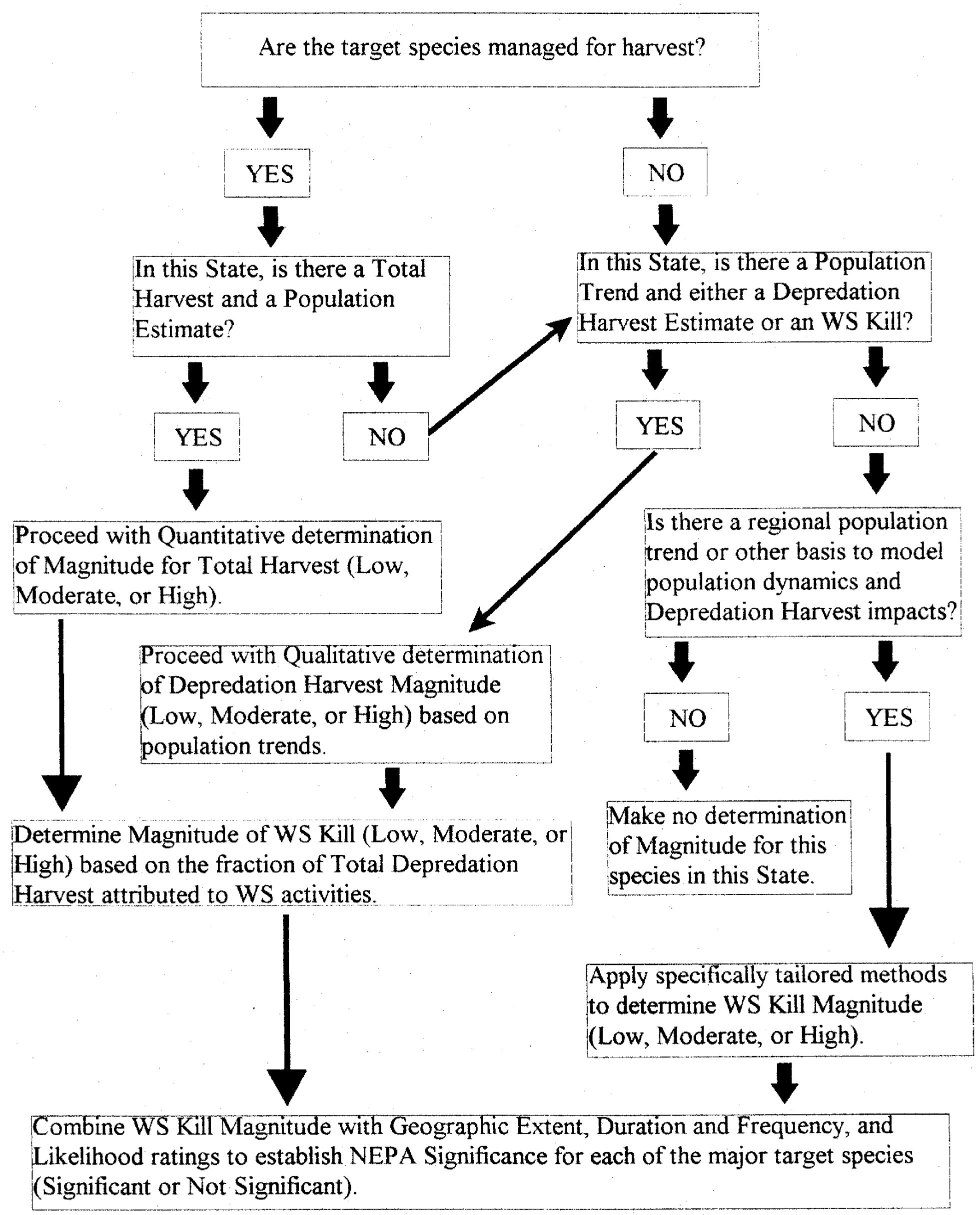



**Figure 4.1. Procedures for evaluating APHIS-WS Program Impacts on abundance of major target species, as established in the USDA-APHIS ADC Programmatic EIS (1997, revised)**

The program effect is:

**Low**; if the species take occurs in less than 34 percent of the area along the Lower Columbia and Snake River region.
**Moderate**; if the species take occurs in 34 to 66 percent of the area along the Lower Columbia and Snake River region.
**High**; if the species take occurs in more than 66 percent of the area along the Lower Columbia and Snake River region.

The project footprint comprises the eight dam sites, and the barge release site. Conservatively assuming a maximum of one mile upstream and downstream per dam, and the barge release site as 4 miles long, the total project length is estimated as 20 miles. Therefore, using the maximum project area, approximately 10 percent of the geographic area is affected, which corresponds to the low impact determination. Since the geographic extent is independent of species type, the impact for all species would be LOW.

#### 4.0.1.3 Duration and frequency

The duration and frequency of an impact (whether the impact is a one-time event, intermittent, or continual) also helps define the limits. Duration refers to how many years the control activity has been or could be in operation. Frequency refers to the distinction between continual or intermittent control activities. Continual refers to control actions that occur regularly throughout the year. Intermittent refers to actions that occur sporadically or infrequently throughout the year. The evaluation criteria for duration and frequency are as follows:

**Low** duration and frequency is assigned if a few individuals of a species were taken in 2000, 2001 or 2002, and this species <u>is not expected</u> to be killed each year in the future. Birds may be taken every year, but only intermittently.
**Moderate** duration and frequency is assigned if individuals of a species were taken periodically in 2000, 2001 or 2002, and this species <u>is expected</u> to be taken each year in the future. When damage is severe, lethal control is expected and may occur during critical times, but not continually.
**High** duration and frequency is assigned if individuals of a species were taken over a number of years and are expected to be taken in the future. Year-round lethal measures are expected to continue because the damage problem is not expected to dissipate. Alternatively, birds may not be taken year-round but may be taken on a seasonal basis every year.

#### 4.0.1.4 Likelihood

The likelihood of an impact (whether the impact is likely to occur) is the final evaluation factor. As long as predation or damage continues, the likelihood of control actions occurring is high. When an event is unpredictable or accidental, then the likelihood factor is moderate or low, respectively.

### 4.0.2 Issues and Concerns

The following avian bird deterrent management issues and concerns were identified as relevant to this process:

1. Relative effectiveness of control measures in reducing or minimizing damage to ESA-listed species.
2. Possible impact of control tools on non-target and ESA-listed species.
3. Impact on the populations of avian predators (target species).
4. Humaneness of control tools.
5. Recreation

## 4.1 Impact of the No Action Alternative (Current Program – Alternative 1)

### 4.1.1 Relative Effectiveness in Reducing Avian Predator Activity

The effectiveness of the program may be assessed by determining how successful the tools used were at reducing avian predators usage of areas susceptible to predation in or below fish ladders, spillways, and bypass facilities. Quantifiable data on the effectiveness of individual tools implemented at site-specific areas on the Lower Columbia and Snake Rivers are not available. Jones et. al 1998, 1999 studied the effectiveness of APHIS-WS hazing and lethal deterrent methods, but could not make clear conclusions due to low number of observation data points. Jones et. al 1999 suggests that variability in gull behavior from project to project and the variability in the number of gulls present at any feeding location are complicating factors in analyzing the data. The effectiveness of each tool may be evaluated by using on-site observations by specialists who apply the control action and research conducted on each particular tool. The current program was developed by APHIS-WS from years of observing daily bird behavior in response to various non-lethal and lethal control methods. A passive exclusion system with an intensive hazing program reinforced with limited lethal control, has been determined to be the most effective at reducing the amount of time avian predators spend in susceptible predation areas. The relative effectiveness of avian predator activity for the other alternatives is discussed in Sections 4.2.1 and 4.3.1.

### 4.1.2 Impact on ESA-listed Fish Species and Non-target Avian Predators

The tools used under the No-Action alternative are selective for target species. All capture and removal tools allow for positive identification of target species in order to prevent non-target take. There have been no negative impacts observed on non-target birds. The Corps provided its Biological Assessment to USFWS and NMFS, which identified the program's expected effect on ESA-listed species. The assessment determined that the proposed program may affect, but is not likely to adversely affect bald eagles and bull trout, and would either have no effect on the other ESA-listed listed species or possibly a beneficial effect (see Appendix C). This issue does not pose a significant environmental impact.

### 4.1.3 Impact on Avian Predator Populations

Analysis of avian predator populations is limited to those species lethally removed during avian predator deterrent management. The analysis for magnitude of impact defines magnitude as "*...a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. (see Section 4.0.1 of this document and Chapter 4 of the USDA-APHIS-WS Programmatic EIS (1997, revised)). Quantitative determinations are based on population estimates, allowable take levels, and actual take data. Qualitative determinations are based on population trends and take data when available. The determination of significance is evaluated qualitatively for each target species.

At the Corps dams, APHIS-WS conducts lethal control under the current program in order to condition a behavioral response to non-lethal measures. This is typically required when piscivorous bird population densities are relatively high and non-lethal tools are ineffective. Tables 1 through 9 Appendix G show, by species, the numbers of birds killed and hazed at Corps hydroelectric dams as a result of APD management on the Lower Columbia and Snake Rivers between 1997 and 2002.

Individual colony data have been collected, but precise counts of the bird populations in the Lower Columbia and Snake River region do not exist. When precise population estimates are lacking, it is common practice for management agencies to use population trend analyses to determine if species populations are 'increasing', 'stable', or 'decreasing'. These trend analyses are determined by taking actual counts at specific locations at regular intervals and comparing several years of data. When the Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) routes do not include habitat commonly used by avian predators, direction from wildlife management agencies and published literature, such as those mentioned above, may be used to determine population trends. Often times, published literature provides some of the best information available on population trends.

**Breeding Bird Survey**

The BBS is a large-scale survey initiated 1966 to monitor the status and trends of breeding birds throughout North America. This survey has provided more than 30 years of data on abundance, distribution, and population trends for more than 400 bird species (Downes and Collins 2003). These data are calculated annually by the United States Geologic Survey (USGS) Patuxent Wildlife Research Center. The BBS index is taken from the BBS, a summer count survey conducted by volunteers and coordinated by the USGS to monitor long-term population trends at the state, regional, and national level. Like other surveys, the BBS is based on a number of assumptions, biases, and limitations. For example, the BBS is limited by placement of roads, traffic noise interference in some cases, and preference of some bird species for roadside habitats (Bystrak 1981). Given that 22% of the species in the survey can be characterized as birds with specialized habitats or limited distribution in the BBS range (Sauer et al.

2001). This survey has not characteristically been the best population monitoring tools for colonial nesting species such as gulls, terns, and cormorants. BBS counts of all the species discussed in this EA can be highly variable and inconsistent from one year to the next. The BBS generally uses roads for survey routes, and as such, it has not characteristically been the best population monitoring tool for colonial nesting species such as gulls and cormorants. A measure of the statistical significance of a trend is represented by a “P” value. The USFWS has stated that those species with “P” values greater than 0.1 do not show trend estimates with an acceptable level of certainty or significance (USDA 2001).
BBS data are provided at http://www.mbr-pwrc.usgs.gov/bbs/bbs.html.

**Christmas Bird Count**
The CBC index is derived from a winter count survey conducted by the National Audubon Society (NAS) in December and January, and is used primarily as a historical reference to indicate declines in species at the state, regional, and national level. The 100-year population trend analysis was derived from CBC survey year 1901 through 2001 in both Washington and Oregon States. Unlike the BBS, large portions of the Columbia River basin, including those areas along the Lower Columbia and Snake Rivers are surveyed by the CBC. Winter weather patterns often affect bird migrations, therefore these counts vary from year to year. CBC data are provided at http://www.audubon.org/bird/cbc/hr/.

**Published Literature**
California gulls, ring-billed gulls, and double-crested cormorants are the primary avian predators in the Columbia River basin (NMFS 2000 b,c). A fairly large body of published literature exists which documents population trends and other biological information for these species.

Appendix G contains BBS and CBC data and published literature for primary and secondary predators, and contains the details for the impact analysis that were performed.

#### 4.1.3.1 Summary of impacts to gulls

The target gull species considered were *California gull*, *ring-billed gull*, and *herring gull.* The determination made is that the program is not likely, nor designed, to impact gull populations on a regional basis. To reduce gull usage of site-specific areas where juvenile salmonids are unnaturally exposed and susceptible to predation may require that some individuals be lethally removed. Most of the lethal efforts to reduce damage have been directed toward California and ring-billed gulls (Appendix G, Table 1). Thus far, there has been no discernable impact on gull population levels.

### Evaluation factor determination for Gulls

In order to determine the significance of the program on California, ring-billed, and herring gull populations in Washington State, the magnitude, geographic extent, and duration and frequency of the program activities were assessed, as well as the likelihood of those activities occurring in the future.

#### Magnitude

- California gull population trend: INCREASING
- Ring-billed gull population trend: INCREASING
- Herring gull population trend: INCREASING
- The APHIS-WS program take in Washington State is greater than 66 percent of the total Depredation Permit take of both California and ring-billed gulls.

Since the take is greater than 66 percent of the of the total depredation permit take, the magnitude is considered equivalent to the population trend rating. Therefore, based on the criteria established is Section 4.0.1, since local populations are increasing, the magnitude of the program effect on California, ring-billed, and herring gulls are LOW.

#### Geographic Extent

The program is implemented at site-specific locations that comprise approximately 10% of the Lower Columbia and Snake Rivers region. Therefore, based on the criteria established is Section 4.0.1, the geographic extent factor of the program on gull species is LOW.

#### Duration and Frequency

California, herring, and ring-billed gulls were taken periodically in 2001 and 2002 and are expected to be taken each year in the future.

These species are opportunistic and follow juvenile fish migration. Therefore, the taking of these species on a seasonal basis at hydroelectric dams and hatchery facilities is expected. Based on the criteria established is Section 4.0.1, the duration and frequency factor of the program on gull species is determined to be HIGH.

#### Likelihood

The presence of California, ring-billed and herring gulls at hydroelectric dams and hatchery facilities during smolt migration is predicted to continue.

California and ring-billed gull population trends are increasing and program activities to reduce ESA-listed and non-listed juvenile salmonid predation at site-specific areas along the Lower Columbia and Snake Rivers have not negatively impacted populations of gull colonies. Therefore, based on the criteria established in Section 4.0.1, the likelihood of control actions being requested and carried out to reduce California, ring-billed and herring gull usage of tailraces and hatchery facilities is determined to be HIGH.

**Impact rating determination for gulls**

Based upon the analysis above, the impact of APD management activities on California, ring-billed and herring gulls is determined to be LOW based on Table 4.2 criteria.

A cumulative impact analysis of gulls taken at Corps facilities indicated the take level of California, ring-billed, and herring gulls for the purpose of site-specific damage control was not likely to affect populations at the regional or national scale (USDA 2001). Overall, based upon recent and historical studies conducted on California and ring-billed gulls in the Pacific Northwest, these trends show populations that currently appear to be healthy and increasing, and herring gull populations that appear to be healthy and stable or increasing.

#### 4.1.3.2 Summary of impacts to double-crested cormorants

The determination made is that the program is not likely, nor designed, to impact double-crested cormorant populations on a regional basis. However, some individuals could be killed on a site-by-site basis. Thus far, there has been no discernable impact on double-crested cormorant population levels.

**Evaluation factor determination for Double-crested cormorants**

In order to determine the significance of the program on double-crested cormorant populations in Washington State, we examined the magnitude, geographic extent, and duration and frequency of activities, as well as the likelihood of those activities occurring in the future.

**Magnitude**

- Double-crested cormorant population trend: INCREASING
- The APHIS-WS program take in Washington State is greater than 66 percent of the total Depredation Permit take of double-crested cormorants.

Since the take is greater than 66 percent of the of the total depredation permit take, the magnitude is considered equivalent to the population trend rating. Therefore based on the criteria established in Section 4.0.1, since local populations are increasing, the magnitude of the program on double-crested cormorants is LOW.

**Geographic Extent**

The program is implemented at site-specific locations that comprise approximately 10% of the Lower Columbia and Snake Rivers region. Therefore, based on the criteria established in Section 4.0.1, the geographic extent factor of the program on Double-crested cormorants is LOW.

**Duration and Frequency**
Double-crested cormorants were taken periodically in 2001 and 2002 and are expected to be taken each year in the future.

This species feeds almost exclusively on fish, therefore, the taking of these species on a seasonal basis at hydroelectric dams and hatchery facilities is expected. Based on the criteria established in Section 4.0.1, the duration and frequency factor of the program on double-crested cormorants is determined to be HIGH.

**Likelihood**
The presence of double-crested cormorants at hydroelectric dams and hatchery facilities during smolt migration is predicted to continue.

Double-crested cormorant population trends are increasing, particularly in eastern Washington, and program activities to reduce ESA-listed and non-listed juvenile salmonid predation at site-specific areas along the Lower Columbia and Snake River region have not negatively impacted cormorant colony population. Therefore, based on the criteria established in Section 4.0.1, the likelihood of control actions being requested and carried out to reduce double-crested cormorant usage of the tailrace areas below hydroelectric dams and at hatchery facilities is HIGH.

**Impact rating determination for Double-crested cormorants**

Based upon the analysis above, the impact of APD management activities on double-crested cormorants is determined to be LOW based on Table 4.2 criteria.

The No-Action alternative is not likely, nor designed, to impact double-crested cormorant populations on a regional basis. To reduce double-crested cormorant usage of site-specific areas where juvenile salmonids are unnaturally exposed and susceptible to predation may require that some individuals be lethally removed. Impact to double-crested cormorant population levels has not been discernable. The cumulative impact of double-crested cormorants take level at Corps facilities, for the purpose of site-specific damage control, was not likely to affect populations at the regional or national scale (USDA 2001). Overall, based upon recent and historical studies conducted on double-crested cormorants in the Pacific Northwest, these trends show populations that currently appear to be healthy and increasing.

4.1.3.3 Impact to secondary avian predators

Limited lethal control of western grebes, and common mergansers (Appendix G, Table 1) has been authorized under the current program when individuals congregate in or below fish ladders, spillways, and outfalls or within a facility (eg. bypass channel), and only when non-lethal deterrents have been ineffective. This control would be expected to continue at levels that the USFWS would determine to be insignificant to population health and viability at the local, regional, and national scale.

American white pelicans are listed as a Washington State endangered species. The American white pelican's persistence and use patterns below the McNary Dam complex implicates them as contributors to juvenile salmonid mortality (CORPS 2003). They were consistently observed in the tailrace in small numbers in mid-April, 2002. A maximum instantaneous count of 24 pelicans was recorded. The diel foraging pattern of the pelicans generally coincided with the diel pattern of salmonid passage through the bypass system. Bird deterrent measures employed at the dam for other piscivorous birds initially altered the foraging behavior of the American white pelicans. However, the pelicans rapidly acclimated (CORPS 2003).

State agencies have also expressed concern for great-blue heron colonies. Therefore, great-blue herons and American white pelicans would not be taken, under the program. American white pelicans would only be intentionally hazed if they are within 50 feet of the juvenile fish outfall for longer than 10 minutes. All secondary predators, including great-blue heron and American white pelican, may be subject to non-lethal measures when congregated at the same site-specific areas where juvenile salmonids are unnaturally exposed and susceptible to predation.

Caspian tern population trends are increasing and activities to reduce ESA-listed and unlisted juvenile salmonid predation at locations along the Lower Columbia and Snake Rivers have not negatively impacted the species population trend in the region (Roby et al. 2003, Roby et al. 1999). The number of Caspian terns hazed at the dams has increased in the past several years (Appendix G Table 1), which indicates an increased presence. Caspian terns are currently hazed only, and therefore the program ahs a low impact on Caspian terns. The likelihood of future control actions being requested and carried out to reduce Caspian tern usage of tailrace areas is unpredictable and contingent upon the results of ongoing research.

Since secondary predators are generally defined as those seen occasionally on-site, they are by definition low in numbers, and therefore the magnitude of impact can be assumed to be LOW. An exception would be in the case of a sensitive, threatened of endangered species, such as American white pelican. However the program's magnitude of impact on white pelican would similarly be low because individuals would be protected based on their sensitive status.

The geographic extent for the program is also determined to be LOW, based on a project size of 10% of the size of the region. The combined factors of low magnitude and low geographic extent, based on Table 4-2, determine a LOW impact rating. Therefore, the impact rating for all secondary predators is LOW, and consequently impacts to secondary predators are not significant.

### 4.1.4 Humaneness of Control Tools

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important and complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. Some individuals and groups are opposed to some of the management actions and tools used by the Corps. Most animal welfare organizations do not oppose the concept of wildlife damage control. However, these organizations support restrictions on control tools perceived by them as inhumane, and strongly emphasize the use of non-lethal tools. Animal rights advocates oppose any killing or harming animals for human gain, because they believe animals have rights equal to or similar to humans (Schmidt 1989, Wywialowski 1991). Other organizations believe that birds are being unnecessarily targeted as scapegoats for salmon losses, while diverting attention away from the real threats to salmon, which include dams and loss of habitat (Seattle Audubon Society, Action Alert, undated). Other bird groups recognize that avian predation may be significant in rare, localized situations (American Bird Conservancy, Policy). Most wildlife managers agree that lethal control is a sound, and sometimes necessary, wildlife resource management practice (Berryman 1987).

Exclusion techniques, as would be implemented, would be expected to have little or no effect on humaneness. Some could argue that behavior modification (through harassment) is stressful to the target species. Some could view removal of selected individuals, which are acclimated to hazing, as inhumane. The Corps supports the most humane, selective, and effective control techniques that meet the program objectives. Control tools employed under Alternative 1 are listed and discussed in Section 2.1. The humaneness of the lethal take control tool under Alternative 1 does not pose a significant environmental impact.

#### 4.1.5 Impact on Recreational and Aesthetic Opportunities

The exclusion systems and hazing efforts relocate bird species to areas outside the restricted areas and into adjacent publicly accessible areas. Dispersing birds out of the restricted and protected areas make them more accessible for general viewing by the public at large.

Aesthetics is the philosophy dealing with the nature of beauty or the appreciation of beauty. Therefore, aesthetics is subjective in nature, dependent on what an observer regards as beautiful or distasteful. The mere knowledge that wildlife exists is a positive benefit to many people (Fulton et al. 1996). Human dimensions of wildlife damage management include identifying how people are affected by problems or conflicts between them and wildlife, attempting to understand people's reactions, and incorporating this information into policy and management decision processes and programs (Decker and Enck 1996; Decker and Chase 1997).

The Corps recognizes the recreational opportunity and aesthetic importance of wildlife and associated viewing opportunities, but also acknowledges that increased opportunity for predation of threatened and endangered juvenile salmonids occur at site-specific areas. Under the proposed program there would be minimal localized impact on specific viewing opportunities of some individual birds or flocks during and after hazing or lethal take events. However, wildlife populations as a whole have not been negatively affected, and viewing opportunities may have been relocated to areas more accessible to the public. The positive impact of increased public viewing opportunities would be expected to continue. The environmental impact of recreational/aesthetic opportunities does not pose a significant environmental impact.

## 4.2 Impact of the Non-Lethal Only Alternative (Alternative 2)

### 4.2.1 Relative Effectiveness in Reducing Avian Predator Activity

The effectiveness of control measures under this alternative would most likely decrease when compared to Alternative 1, because lethal tools implemented would no longer be available. The Corps would use only non-lethal tools to resolve piscivorous bird damage situations under this alternative. Technical assistance would be provided in the context of a modified IWDM approach. The Corps would still use the APHIS-WS Decision Model to determine the best approach for resolving wildlife damage, but lethal tools would be administratively screened from consideration in formulating control strategies. Persistent avian predators that become desensitized to hazing would be allowed to remain in the areas where juvenile salmon are susceptible to predation in or below fish ladders, spillways, and bypass facilities. As a result, this alternative would less effectively minimize and mitigate impacts to ESA-listed salmonids to the "maximum extent practicable" as stated by NMFS 2000 BiOp, RPA action 101. In order to compensate for the decreased relative effectiveness, additional and potentially substantial cost would be incurred in an attempt to obtain effectiveness equivalent to that of Alternative 1. In time, non-lethal technologies may be developed that would deter these persistent predators at a cost comparable to that achieved under Alternative 1, but the timeframe for their development of these technologies is unknown. It is most likely and reasonable to expect that Alternative 2 would be substantially more costly than Alternative 1 and does not pose a significant environmental impact.

### 4.2.2 Impact on ESA-listed Fish Species and Non-Target Avian Predators

Alternative 2 would have minimal impact on non-target avian species. Without the lethal control tool available in Alternative 1, there is a potential for impact on ESA-listed fish species when piscivorous birds to fail to associate danger and death with loud noises, and when individual birds that are not frightened away, in turn attract more birds beneath the wire exclusionary systems. Additional non-lethal efforts would be required to prevent avian predators from congregating where smolts are most vulnerable to prevent potentially impacting ESA-listed fish species. This issue does not pose a significant environmental impact.

### 4.2.3 Impact on Avian Predator Populations

The alternative would have minimal impact on avian predator populations. It would be expected that the impact of Alternative 2 would be similar to Alternative 1, because the annual take of piscivorous birds at Corps dams is low when compared to overall populations. Additionally, the loss of lethal tools may lead to the accelerated habituation of piscivorous birds to non-lethal tools, rendering non-lethal tools less effective or ineffective at deterring feeding in areas where smolts are most vulnerable.

### 4.2.4 Humaneness of Control Tools

This alternative would not request lethal direct control of avian for the protection of ESA-listed salmonids. Therefore some would say that this alternative is more humane that Alternatives 1 and 3, that could employ the use of lethal control. The environmental impact of the humaneness of control tools is the same as Alternative 1, in that it does not pose a significant environmental impact.

### 4.2.5 Impact on Recreational and Aesthetic Opportunities

The impact on recreational and aesthetic opportunities by this alternative would be similar to the Alternative 1 (Section 4.1.5), because the exclusion systems and hazing efforts disperse birds out of the restricted and protected areas and make them more accessible for general viewing by the public at large. The potential need to construction more elaborate exclusionary systems downstream on each dam to attempt to compensate for the effectiveness loss of lethal control may decrease the aesthetic value of those who use the river for recreation. Fishing tackle has been retrieved from those wires furthest downstream, and on rare occasions these wires appear to have been intentionally cut. The environmental impact of recreational/aesthetic opportunities is the same as Alternative 1, in that it does not pose a significant environmental impact.

## 4.3 Impact of the Exhaust All Non-Lethal Tools First Alternative (Alternative 3)

### 4.3.1 Relative Effectiveness of Reducing Avian Predator Activity

Alternative 3 would require that all non-lethal tools be implemented regardless of practicality before any lethal tools are recommended or used. Practicality is defined as being *disposed to action as opposed to speculation or abstraction... designed to supplement theoretical training by experience* (Merriam-Webster 1999). Under Alternative 3, *any* non-lethal tool that may reduce avian predation would be used before any lethal tool would be implemented. For example, even speculative untested methods or costly less effective methods would take precedence over the use of any lethal tool.

The effectiveness of tools under this alternative would potentially be decreased compared to the Alternative 1, because use of lethal tools may be delayed. Implementing less effective non-lethal methods prior to more relatively effective lethal methods would less effectively minimize and mitigate impacts to ESA-listed salmonids to the “maximum extent practicable” as stated by NMFS 2000 BiOp, RPA action 101. Implementing any non-lethal alternative to deter persistent predators, even those with decreased effectiveness, would be at a greater cost than Alternative 1. In order to compensate for the decreased relative effectiveness, additional and potentially substantial cost would be required to obtain the same effectiveness. In time, non-lethal technologies may be developed that would deter these persistent predators at a comparable cost, but the timeframe for development of these technologies is unknown.

It is most likely and reasonable to expect that Alternative 3 would be significantly more costly than Alternative 1 and does not pose a significant environmental impact.

#### 4.3.2 Impact on ESA-listed Fish Species and Non-Target Avian Predators

Impacts on non-target and ESA-listed species by Alternative 3 would be similar to Alternative 2 (Section 4.2.2), which is minimal impact on non-target species and ESA-listed salmonid species, provided additional non-lethal effort to compensate for the reduced effectiveness is implemented. This issue does not pose a significant environmental impact.

#### 4.3.3 Impact on Avian Predator Populations

The impact by of Alternative 3 on avian predator populations would be similar to Alternative 1 (Section 4.1.3). This is based on the expectation that lethal tools used under Alternative 1 are used only when non-lethal tools have already been used, or are not expected to be effective. Additionally, the loss of lethal tools may lead to the accelerated habituation of piscivorous birds to non-lethal tools, rendering non-lethal tools even less effective or ineffective at deterring feeding in areas where smolts are most vulnerable.

#### 4.3.4 Humaneness of Control Tools

The humaneness of the control tools under this alternative would be comparable to Alternative 1 (Section 4.1.4). However, some people would believe that exhausting all non-lethal tools before using lethal tools would be more humane than Alternative 1. Others would believe that unnecessarily delaying lethal control would result in the removal of more birds, and thus, be less humane than the Alternative 1. Belant et al. (2000) observed that as bird populations increased, more depredation problems developed, resulting in more birds being taken when lethal tools were ultimately implemented. The environmental impact of the humaneness of control tools is the same as Alternative 1 and 2, in that it does not pose a significant environmental impact.

#### 4.3.5 Impact on Recreational and Aesthetic Opportunities

The impact of this alternative on recreational and aesthetic opportunities would be similar to the Alternative 1 (discussed in Section 4.1.5), because the exclusion systems and hazing efforts disperse birds out of the restricted and protected areas and make them more accessible for general viewing by the public at large. The potential need to construct more elaborate exclusionary systems downstream of each dam to attempt to compensate for the effectiveness loss of lethal control may decrease the aesthetic value of those who use the river for recreation. The exclusion systems and hazing efforts would disperse birds out of the restricted and protected areas and may make them more accessible for general viewing by the public at large. The environmental impact of recreational/aesthetic opportunities is the same as Alternative 1 and 2, in that it does not pose a significant environmental impact.

# 5.0 ENVIRONMENTAL COMPLIANCE

Several Federal laws regulate wildlife damage management. The Corps is in compliance with these laws and continues to consult and cooperate with other agencies as appropriate.

**National Environmental Policy Act (NEPA). (42 USC Section 4231, *et seq.*)**
This EA is being prepared pursuant to the NEPA and CEQ implementing regulations, which state that Federal agencies shall identify the effects that their proposed actions may have on the environment. Based on information in the EA, the Corps would determine whether the proposed activity would have a significant effect on the human environment. If it does, an EIS is required. If it is determined that the proposal would not have significant impacts, a Finding of No Significant Impact (FONSI) would be prepared.

NEPA requires that actions be evaluated for environmental impacts, that the decision maker(s) prior to implementation consider these impacts, and that the public be informed. This EA would remain valid until the Corps determines that new needs for action, changed conditions, or new alternatives having different environmental effects that must be analyzed. At that time, this analysis and document may be revised or amended pursuant to NEPA requirements.

This EA has been prepared in compliance with NEPA and currently no significant impacts have been identified. If no significant impacts are identified during the public review process, an EIS would not be required and full compliance with NEPA would be achieved once the FONSI is signed.

**Endangered Species Act. (16 USC 1531-1544)**
The ESA establishes a national program for conservation of endangered and threatened species and their habitat. The Corps conducts consultations with the USFWS and NMFS, as appropriate, to ensure that the Corps' actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify their critical habitats.

The Corps prepared a BA (see Appendix C) that evaluated the affects of the proposed project on the species identified on the Threatened and Endangered species list (see Appendix F). The Corps has determined that the project may affect, but is not likely to adversely affect bald eagles, bull trout, and anadromous fish. The project would have no affect on the other listed species. USFWS consultation correspondence is contained in Appendix I.

For a related project, a Corps BA was prepared for the Bonneville 2 Corner Collector and was submitted to USFWS on March 18, 2002. It determined that the project, including the effort to add flagged exclusion system wires, "may affect, but is not likely to adversely affect" bald eagles. USFWS concurred on May 6, 2002.

The ESA consultation process initially concluded by the 2000 FCRPS BiOp (NMFS 2000b) for this action has now been replaced by the 2004 Biological Opinion on Remand and associated Final Updated Proposed Action (UPA). Avian predation abatement (identified as deterrence in this EA) is addressed in the UPA under "Operation and Maintenance of FCRPS Fish Facilities" where it is considered part of the routine operation and maintenance activities at an FCRPS dam. The Corps will continue to follow the criteria included in the Corps' Fish Passage Plan as annually updated through the FPOM team. The Corps will coordinate with NOAA Fisheries to reconcile comments on the annual Draft Fish Passage Plan concerning ways to reduce take, including take by avian predators, as part of this process prior to the fish passage season or during the fish passage season. The UPA acknowledges that avian deterrent actions are being implemented at FCRPS structures. Therefore, the effects of the preferred alternative, Non-Lethal Tools Only, are addressed in the 2004 Biological Opinion on Remand.

**Migratory Bird Treaty Act (MBTA). (50 CFR 13, 20, 21)**
The MBTA provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. The MBTA prohibits the harming, harassing and take of protected species, except as permitted by the USFWS. Regulated actions within the Corps' current program have been implemented by APHIS-WS and they have obtained a Federal Fish and Wildlife permit covering management activities that involve the taking of migratory species in Washington and Oregon States.

**Animal Damage Control (ADC) Act. (7 U.S.C. 426-426c; 46 Stat. 1468)**
The ADC Act, together with the Rural Development, Agriculture, and Related Agencies Appropriations Act language, authorize and direct APHIS-WS to reduce damage caused by wildlife in cooperation with other agencies. The purpose of the APD program is to reduce damage caused by wildlife. The program implements animal damage control measures by using hazing and exclusion tools, with very limited, individual specific lethal control to supplement non-lethal tools when they are ineffective.

**Migratory Birds (EO-13186).** Executive Order 13186 directs Federal agencies to incorporate bird conservation considerations into agency planning, including NEPA analyses; reporting annually on the level of take of migratory birds; and generally promoting the conservation of migratory birds without compromising the agency mission. The program reports annual take, and promotes the conservation of migratory birds by using hazing and exclusion tools, with very limited, individual specific lethal control to supplement non-lethal tools when they are ineffective.

**Fish and Wildlife Coordination Act, as amended (16 USC 661, et seq)**
This EA is tiered under two EISs, which were both coordinated with the USFWS. USFWS provided a Coordination Act Report (CAR) for each of these EISs. The joint Memorandum of Agreement dated January 22, 2003, between the Corps and USFWS, requires a CAR for new significant actions at existing projects (CORPS and USFWS 2003). The APD program is not a new action and the Alternative 1 Current Program proposed by this EA does not require a significant change. Therefore, the development

of a coordination act report for this project is not required, and this project is in compliance with the Act.

**Heritage Conservation**

Federal historic and cultural preservation acts include the National Historic Preservation Act (NHPA) (16 USC 470-470t, 110), Native American Graves Protection and Repatriation Act (NAGPRA) (43 CFR 10), Archeological Resources Protection Act (16 USC 470aa-470ll), Archeological and Historic Preservation Act (16 USC 469-469c), American Antiquities Act (16 USC 431-433) and American Indian Religious Freedom Act (42 USC 1996). As required under Section 106 of NHPA, the Corps is coordinating with the Oregon State Historic Preservation Office (SHPO) and Washington Office of Archeology and Historic Preservation (OAHP), and other interested parties.

No activities proposed in this EA would adversely affect resources protected under these acts. The Corps consulted with the Oregon State SHPO and Washington State OAHP regarding the currently planned project and determined that the addition of the proposed bird exclusion systems would not alter the historic character of dams old enough to warrant protection under Federal laws. The Bonneville Dam is old enough to warrant protection under Federal laws, but the project does not propose modifications to the existing exclusion system. Only the McNary project was consulted, since it is the only project site where both construction work is being proposed (spillway tailrace area exclusion system protection) and the site would be eligible for the National Register before installation was completed.

The potential future historic character of the other dams, not yet protected by Federal laws, would not be degraded by proposed modifications (see Table 2.2). Therefore, the Corps made the determination that the currently planned portion of the project would affect no historic properties. See Appendix E for the Cultural Resource Inventory report provided to the Oregon State SHPO and Washington State OAHP. At such a time as future construction efforts under the APD program are proposed at National Register eligible dams, cultural reviews of the projects would be performed under Section 106 of the NHPA. Consultation response from Washington OAHP is contained in Appendix I. Oregon SHPO has expressed not to expect response correspondence for routine matters.

**Federal Insecticide, Fungicide, and Rodentcide Act (FIFRA). (7 USC 136)**

FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The EPA is responsible for implementing and enforcing FIFRA. All pesticides, if used, would be registered with the EPA, and State Department of Washington or Oregon, as applicable. The pesticides would be used as stipulated by the label procedures. The program does not currently use any pesticides.

**Investigational New Animal Drug (INAD). (21 CFR Part 511)**

The FDA grants permission to use INAD. Alpha-chloralose is classified as an INAD and cannot be purchased from any source except APHIS-WS. The FDA authorization allows APHIS-WS to use alpha-chloralose to capture geese, ducks, coots, and pigeons.

FDA's acceptance of additional data would allow APHIS-WS to consider requesting expansion for the use of alpha-chloralose for other species. The program does not currently use any INADs.

**Columbia River Gorge National Scenic Area Act. (PL 99-663)**
On November 17, 1986, Congress established the Columbia River Gorge National Scenic Area (CRGNSA) as a Federally recognized and protected area. The Act also created a bi-State Columbia River Gorge Commission and directed the Commission and the USFS to jointly develop a management plan, which included a mandate to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the scenic area. This act applies to the area of the Columbia River between its confluences with the Sandy and Deschutes Rivers. The Bonneville and The Dalles dams, as well as the truck aboard barge release location, are located within the CRGNSA and are zoned as Urban and therefore are not subject to regulation by the Gorge Commission. The barge release site is near the borderline between urban and general management zones. The proposed project would not include any specific actions that would be incompatible with the scenic area management plan. Therefore, the project would be in compliance with the Act.

**Resource Conservation Recovery Act (RCRA). (42 USC 6901 et seq)**
RCRA gives the EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes. No hazardous materials would be used, discarded or produced by this proposed project. Any pesticides, if used, would be used and disposed of in accordance with applicable requirements.

**Noise Control Act. (42 USC 65)**
The purpose of the Noise Control Act is to establish a means for effective coordination of Federal research and activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public with respect to noise emission and noise reduction characteristics of those products. The proposed project would generate infrequent noise in the form of sporadic gunshots or auditory deterrents such as pyrotechnic hazing. This noise would not violate any local, State, or Federal noise regulations.

**Clean Water Act (CWA), as amended. (33 USC 1251 et. seq)**
The CWA sets national goals and policies to eliminate discharge of water pollutants into navigable waters, to regulate discharge of toxic pollutants, and to prohibit discharge of pollutants from point sources without permits. The only proposed project discharge of foreign material into the water would be a minimal amount of steel shot, which would not affect water quality parameters. If pesticides were to be applied, for example tactile, chemosensory or physiological deterrents, prior approval from the various regulatory agencies would be obtained prior to use, as necessary.

**Clean Air Act (CAA), as amended. (42 USC 7401, et seq.)**
The CAA establishes a comprehensive program for improving and maintaining air quality throughout the United States. The proposed actions would comply with the Clean Air Act. The only source of emissions from the proposed project would be de minimis smoke from infrequent gunshots or auditory deterrents such as pyrotechnic hazing.

**Coastal Zone Management Act (CMZA) of 1972. (16 USC 33)** The CMZA requires that all Federally conducted or supported activities directly affecting the coastal zone must be undertaken in a manner consistent to the maximum extent practicable with approved State coastal management programs. The action area is outside the coastal zone. Therefore, the preferred alternative would have no affect on the coastal zone of Oregon or Washington States, and statements of concurrence are not required.

**National Historic Preservation Act, As Amended. (16 USC 470-470t, 110)** As required under Section 106 of the National Historic Preservation Act, the Corps is coordinating with the Washington OAHP and Oregon SHPO. A report describing these findings will be submitted to the OAHP and SHPO for their review. The Corps has determined that the construction of this project would have *no effect* on known cultural resources located in the proposed project area (see Appendix E). The Corps requested concurrence with the determination from the OAHP and SHPO. The OAHP reviewed and concurred with the project report (see Appendix I).

**Environmental Justice (EO-12898)** EO-12898 includes guidelines for all Federal agencies to evaluate activities to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income populations to a greater extent than the general population. Because the management tools proposed would not pose significant risk to humans or their environment, it is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income populations. Also, the species targeted are not a food or income resource for the region's minority or low-income populations.

**Federal, State and Local Permits**
The actions within the Corps' program has been implemented by APHIS-WS, who obtain a USFWS Federal Fish and Wildlife permit for management activities that involve the taking of migratory species in Washington State and part of Oregon State. A 6-month renewable permit was issued 1/01/01 (under CFR 50 part 13 requirements). USFWS is in the process of issuing a new predation permit to APHIS-WS for its management activities on the Lower and Mid-Columbia and Lower Snake Rivers.

A water quality standard modification, if required, would be requested from the appropriate State agency, if pesticides were to be applied to the water.

**Recreation Resources**
The proposed project would not affect Wild and Scenic Rivers, National Trails, Wilderness Areas, National Parks, or other specially designated recreational areas.

# 6.0 CUMULATIVE EFFECTS

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts on the environment, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Under the current program, the Corps, with the assistance of APHIS-WS, addresses damage to piscivorous birds associated with the dams. APHIS-WS is the primary Federal agency with wildlife damage management responsibilities.

## 6.1 Past Actions

Hydroelectric dam development changed the Columbia River basin from mostly free-flowing rivers beginning in 1933 to a series of dams and impoundments by 1975. The reservoirs that formed behind some dams created islands that were ideal for piscivorous bird colonization. Water released below the dam created unnatural food source conditions for these birds. Some bird species have increased in abundance and their current populations are much higher than they were historically, sometimes to the detriment of weakened salmon populations (Federal Caucus 2000).

### Depredation

Depredation is the authorized killing, under a permit, of mammals or birds that might otherwise be protected by law. Permittees are required to submit an annual report of activities to the USFWS each calendar year from the issue date of the permit. Table 6.1 below, summarizes the 6 year average take per year (FY1997-2002) and range (low-high) of these Federally-issued Washington depredation permits for bird species relevant to this EA (USFWS 2002). These figures include permits issued for research and wildlife damage management.

**Table 6.1. Average Take and Range of Piscivorous Species Lethally Removed in Washington State under USFWS Depredation Permit (FY1997- 2002)**

| | Average take per year | Range (low-high) |
|---|---|---|
| California gull: | 1,869 | 94 – 3,245 |
| Ring-billed gull: | 6,228 | 30 – 11,604 |
| Herring gull: | 253 | 40 – 543 |
| Double-crested cormorant: | 715 | 6 – 1,347 |
| Caspian tern[1]: | 397 | 1 – 1,069 |
| Great-blue heron: | 141 | 0 – 292 |
| Common Merganser[2]: | 223 | 0 – 388 |

[1] In addition, approximately 730 viable Caspian tern eggs were removed by WDFW in Commencement Bay, WA in 2001 under a general scientific collecting permit.
[2] Prior to 2001, there was not a separate MIS code for common mergansers. Instead, they were recorded and "Merganser, Other."

**Effects of Lead Shot**

Because shooting is one component of the proposed program, the deposition of lead shot in the environment is a potential factor considered in this EA. Threats of lead toxicosis to waterfowl and other wildlife from the deposition of lead shot in waters where such species fed were observed more than one hundred years ago (Sanderson and Bellrose 1986). As a result of discoveries made regarding impacts to several species of ducks and geese, Federal restrictions were placed on the use of lead shot for waterfowl hunting in 1991. Regulations regarding this are found in 50 CFR 20.21.

Steel shot is used on Corps facilities during APD management activities. Consequently, deposition of lead in nontoxic shot zones does not occur as a result of these activities. Therefore, no cumulative impacts are expected related to lead toxicosis and shooting as a tool.

**Caspian Tern Relocation Efforts**

A pilot study was conducted in 1999 to test the feasibility of colony relocation as a method to reduce the magnitude of Caspian tern predation on juvenile salmonids. Using habitat modification and social attraction (i.e., tern decoys and audio playbacks) to encourage nesting on East Sand Island and grass planting, fencing, and harassment of terns to discourage nesting on Rice Island, approximately 1,400 nesting pairs were relocated from Rice Island to East Sand Island in 1999. Terns nesting on East Sand Island consumed approximately 40% fewer juvenile salmonids compared to terns nesting on Rice Island, presumably due to the proximity of East Sand Island to marine habitats. Based on these results, regional fish and wildlife managers decided to pursue a management plan to relocate all Caspian terns nesting on Rice Island to East Sand Island. See Appendix A, Plate 2 for island locations.

In 2000, the management plan sought to prevent all nesting by Caspian terns on Rice Island and to attract all the terns that formerly nested at Rice Island to 4 acres of tern nesting habitat on East Sand Island. However, a court-ordered restraining order precluded passive and active harassment at Rice Island, and some of tern nesting did occur on Rice Island in 2000.

Most terns did relocate to East Sand Island, however, resulting in about 8,500 pairs nesting there, for a total estuary population of about 9,100 breeding pairs. This relocation resulted in an estimated 4.4 million fewer smolts being consumed by estuary terns in 2000 than in 1999. Terns consumed about 6.1 to 8.6 million smolts in 2000 (Columbia Bird Research 2002). In 2001 and in 2002 the entire colony nested on 3.9 and 4.5 acres, respectively, on East Sand Island. Terns did not nest on Rice, Miller, Sands or Pillar Rock in 2002. There were about 9,000 breeding pairs of terns in 2001 and over 9,900 pairs in 2002 (Columbia Bird Research 2002).

A court settlement from the U.S. District Court for the Western District of Washington, signed April 2, 2002, requires the defendants (Corps and USFWS) to prepare an interim EA addressing management actions pending completion of a Caspian tern management plan/EIS. The settlement requires the creation of at least 6 acres of suitable tern habitat on East Sand Island, and allows harassment of terns on Rice, Miller, Sands and Pillar Rock Islands, up until nesting season. Development of a management plan/EIS for management of Caspian terns in the Columbia River Estuary is required by the settlement. The USFWS, assisted by the Corps and NMFS, is required to have a completed plan/EIS by February 2005. Completion of three documents is also required to develop the plan/EIS:

1) Avian predation analysis to determine levels of predation that do not impede salmon recovery (completed by NMFS in September 2002);
2) Status Assessment of Caspian terns (completed by USFWS in August 2002) and
3) Feasibility study of potential Caspian tern nesting sites in the Pacific Northwest.

The USFWS Caspian Tern Site Feasibility Assessment (Seto et al. 2003) reported there was no management potential on the Mid-Columbia River islands because it would not reduce Columbia River impacts. As a result of the relocated tern colony in the Columbia estuary, juvenile salmon take in 2002 was reduced 67 percent from an estimated 18 million to 6 million. (http://www.columbiabirdresearch.org/)

## 6.2 Present and Reasonably Foreseeable Future Actions

### Use of Avicides

The avicide, DRC-1339 Concentrate – Gulls, registered by the EPA (EPA #56228-17) is the only foreseeable chemical that would be used in this program for the purpose of obtaining lethal effects on gulls. The use of DRC-1339 has been analyzed with regard to migratory birds in Washington State (USDA 2001 and USDA 1997, revised). This chemical has been evaluated for possible residual effects that might occur from the buildup of the chemicals in soil, water, or other environmental sites. DRC-1339 exhibits a low persistence in soil or water, and bioaccumulation of the chemical is unlikely (USDA 1997, revised). The USFWS has concurred that the use of DRC-1339 in Washington States is not likely to adversely affect Federally-listed bird species (USDA 2001).

Based on use patterns, chemical and physical characteristics of avicides used in Washington State, and factors related to the environmental fate of DRC-1339, very low or negligible impacts would be expected from the potential use of DRC-1339, if used to reduce immediate threats of gull predation to ESA-listed juvenile salmonids.

### Additional Relocation Efforts

The Caspian tern population at Crescent Island (upstream of McNary) is increasing. More than 12,000 PIT tags were found on Crescent Island in 2002. This represented a minimum mortality rate of 9.7% for steelhead and 1.5% for yearling Chinook for research fish leaving Lower Monumental Dam (Muir, et. al 2003). This data indicate a very high juvenile salmonid “take” by the Caspian Tern population on Crescent Island. See Appendix A Plate 2 for islands used for avian nesting.

Crescent Island is Federal property that the Corps administers and currently leases to USFWS. Future translocation efforts are a foreseeable action that would involve habitat modification similar to that undertaken at Rice Island. Because habitat modifications have the potential to affect both target and non-target species, any translocation project would be evaluated and any additional separate NEPA documentation needed would be prepared.

**Expansion of Exclusion Systems at Dams**

Under the preferred alternative, there are plans to increase the exclusion system coverage at several dams by moving the attachment points and wires to protect unprotected juvenile bypass outlets and tailrace area. See Table 2.2 for locations and descriptions of proposed exclusion system expansion. Expansion of exclusion systems on other non-Corps operated dams on the Columbia River system is a foreseeable action with anticipated beneficial cumulative impacts.

**Actions by Others**

It is reasonable to expect if governmental assistance in resolving wildlife conflicts were to decrease, impact to others may increase and controlled actions may decrease. A controlled program is seen as having a positive cumulative impact.

The management of piscivorous bird damage for the five publicly owned hydroelectric dam and hatcheries on the Mid-Columbia River was evaluated (USDA 2003), and made a FONSI determination. The dams on the Lower Columbia and Lower Snake Rivers, in contrast, are Federally-operated by the Corps of Engineers. Both entities are action agents, with responsibility to perform environmental assessments for their own projects and programs. They each receive separate funding to implement their programs. Separate environmental documentation has been prepared, with each including the other in its cumulative effects section. USDA Animal and Plant Health Inspection Service / Wildlife Services (APHIS-WS) has performed, under contract, APD Program services for both agencies.

## 6.3 Summary

The scope of this proposal and the number of piscivorous birds that might be adversely affected under any of the alternatives carried forward would result in very low or negligible direct or indirect impacts. Cumulative impacts of public actions to control piscivorous birds to reduce avian predation can only be projected based on the best information available. Despite recent efforts taken to reduce damage by target species in specific locations and circumstances, regional and national populations for gulls, Caspian terns and double-crested cormorants have remained healthy. The Corps will maintain ongoing contact with APHIS-WS, USFWS, NMFS, ODFW, and WDFW to ensure local, state and regional knowledge of wildlife management objectives concerning the preferred alternative.

The proposed program, taken together with other past, present, and reasonably foreseeable future actions would have a very low or negligible impact on non-target, sensitive, and protected species (see also the EA Piscivorous Bird Management for the Protection of Juvenile Salmonids on the Mid-Columbia River (USDA 2003), Management of Damage Caused by Migratory Birds in the State of Washington EA (USDA 2001), and the Animal Damage Control Program Programmatic EIS (1997, revised).

# 7.0 PREFERRED ALTERNATIVE

The Non-Lethal Tools Only (Alternative 2) is the preferred alternative and is discussed in Section 2.2 in further detail.

The preferred alternative consists of using:

- APHIS-WS and/or other qualified technical assistance;
- All practical and effective non-lethal control methods;
- New NWRC and/or other agency approved wildlife damage management tools developed through research that can be evaluated for inclusion into the Corps program.

Tools for Use under Alternative 2:

- Visual Deterrents
- Auditory Deterrents
- Exclusion

Tools that are Available, but not Currently Used:

- Tactile Repellents
- Chemosensory and Physiologic Repellents
- Habitat Modification
- Translocation
- Contraceptives
- Egg Addling
- Avicides

This EA has been prepared in compliance with NEPA and no significant impacts have been identified to date. If no significant impacts are identified during the public review process, an EIS will not be required. Full compliance with NEPA would be achieved once a FONSI is signed.

# 8.0 PREPARERS, REVIEWERS, AND ENTITIES CONTACTED/CONSULTED

## 8.1 Reviewers and Preparers

**Corps of Engineers**

| **Walla Walla District** | **Portland District** |
|---|---|
| Stan Heller NWW | Lynne Hamilton NWP |
| Ben Tice NWW | Calvin Sprague NWP |
| Dave Hurson NWW | Gary Johnson NWP |
| Rex Baxter NWW | Robert Cordie NWP |
| Mark Plummer NWW | |

**USDA APHIS**

Jason Gibbons, Wildlife Biologist
Shannon Hebert, Environmental Coordinator
Michael Linnell, Assistant State Director WA/AK
Roger Woodruff, State Director WA/AK

## 8.2 Entities Contacted, Consulted, and/or Coordinated

United States Fish and Wildlife Service (USFWS)
National Marine Fisheries Service (NMFS)
Oregon Department of Fish and Wildlife (ODFW)
Washington Department of Fish and Wildlife (WDFW)
Northwest Power Planning Council (NPPC)
Columbia River Intertribal Fish Commission (CRITFC)
Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
Nez Perce Tribe
Confederated Tribes of the Colville Reservation
Confederated Tribes and Bands of the Yakama Indian Nation
Confederated Tribes of Warm Springs
Cowlitz Indian Tribe

# APPENDIX A

## PLATES

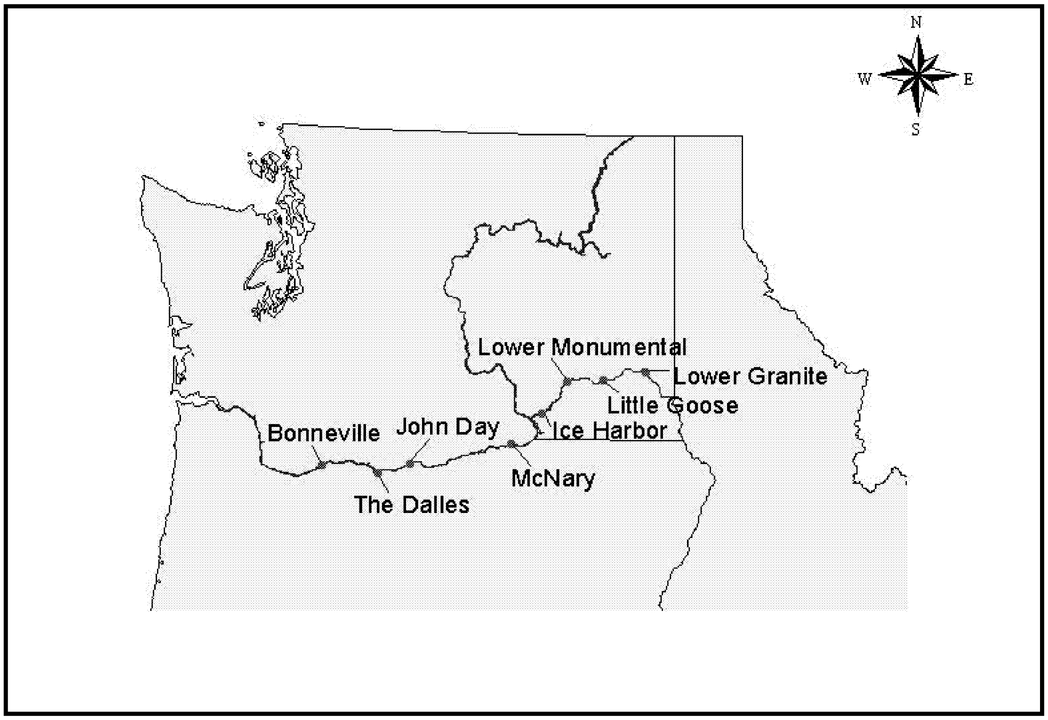



Plate 1 – Project Locations Map

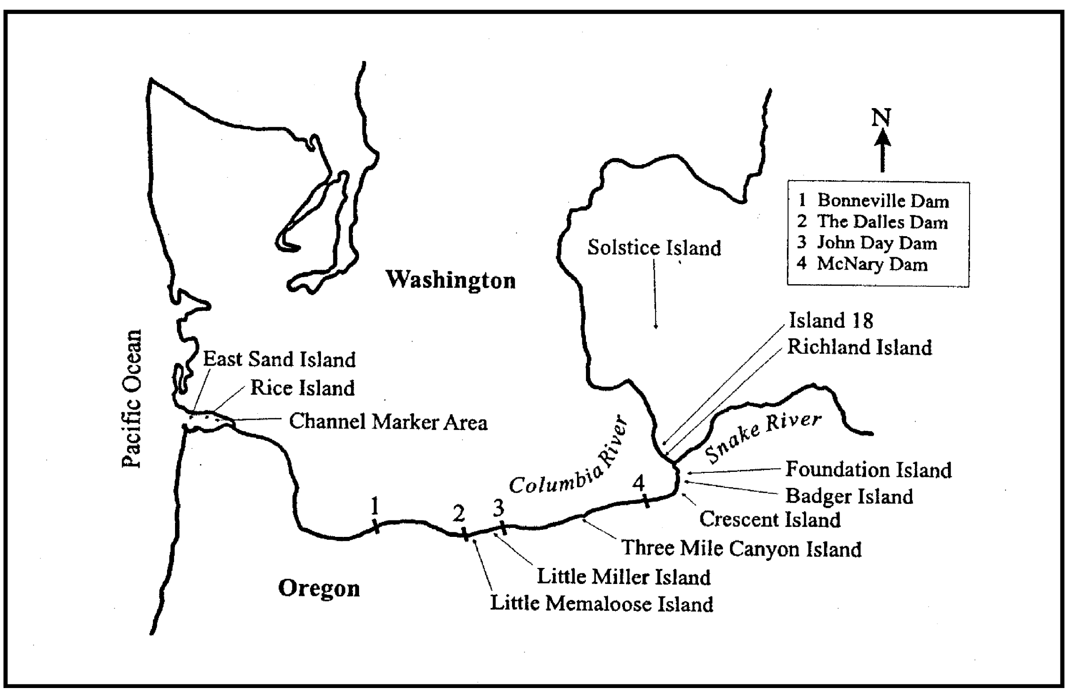
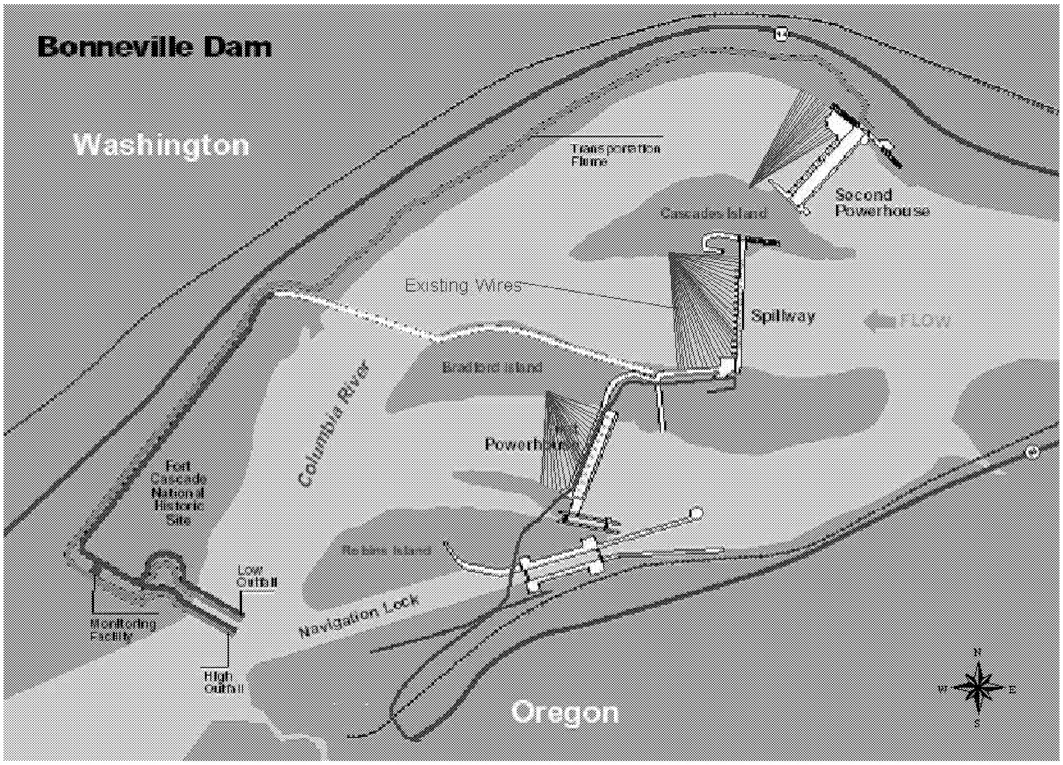
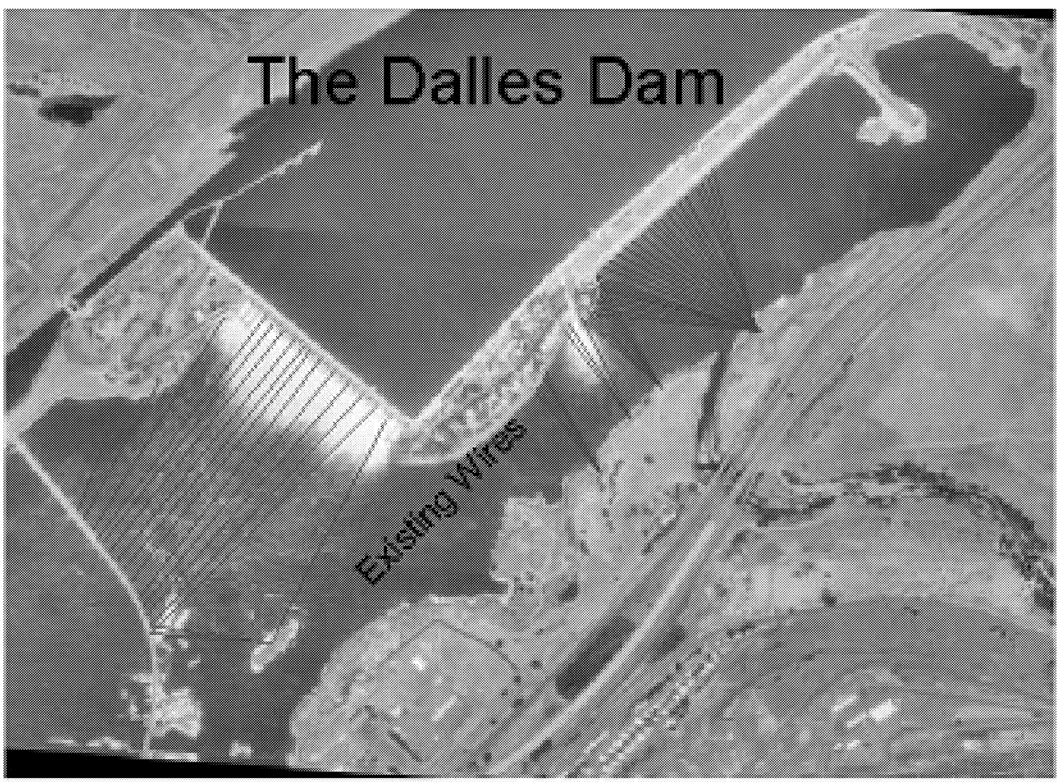


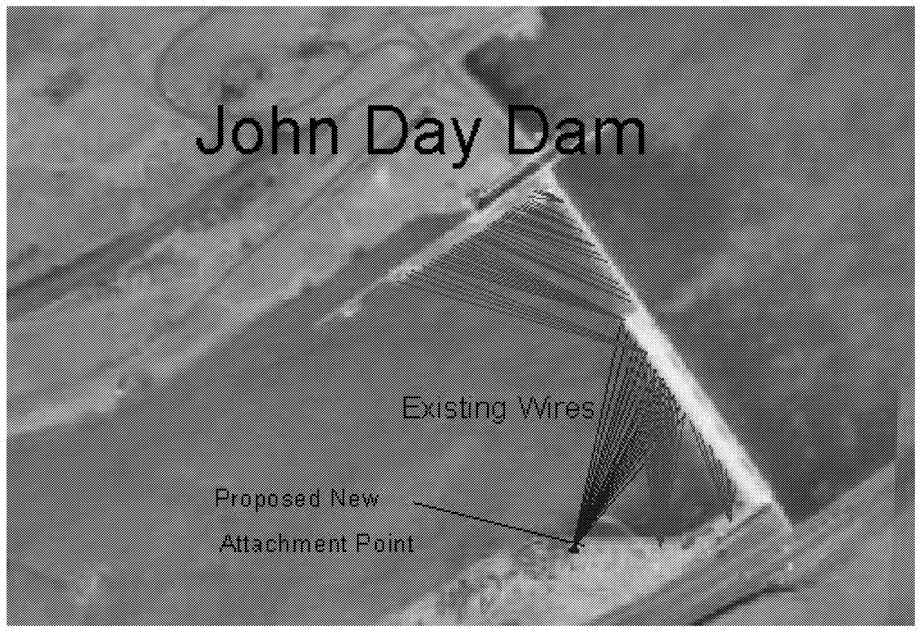

Plate 2 – Locations of Avian Nesting Areas in the Columbia River Basin

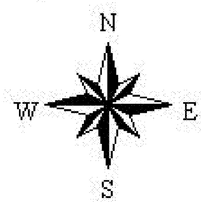


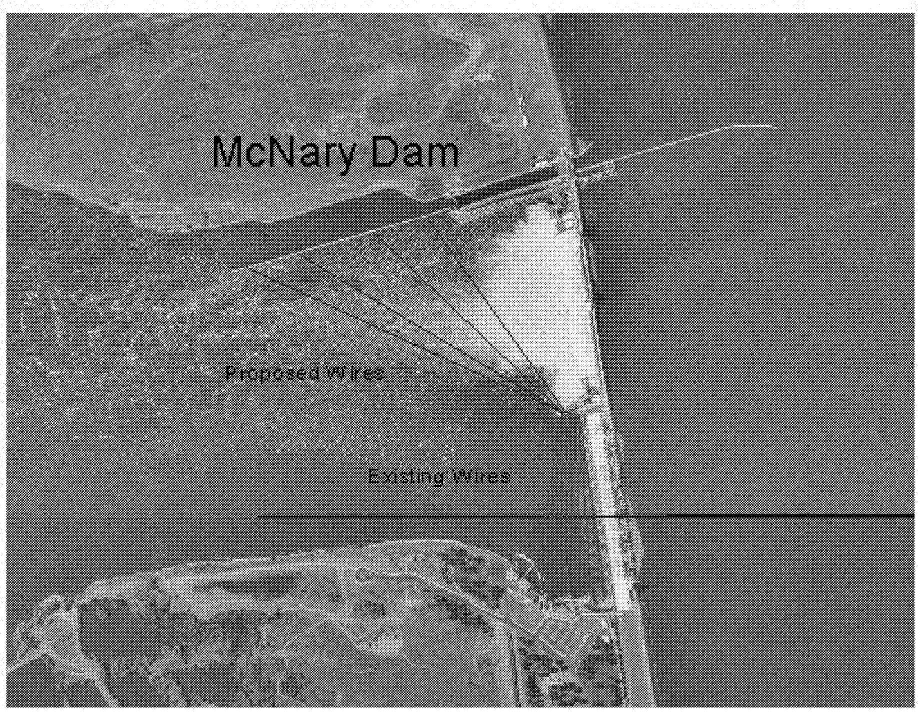




Existing Wires
Proposed Wires

Plate 3 – Bird Exclusion Systems; existing and proposed at Bonneville and The Dalles Dams




Existing Wires
Proposed Wires

Plate 4 – Bird Exclusion Systems; existing and proposed at John Day and McNary Dams

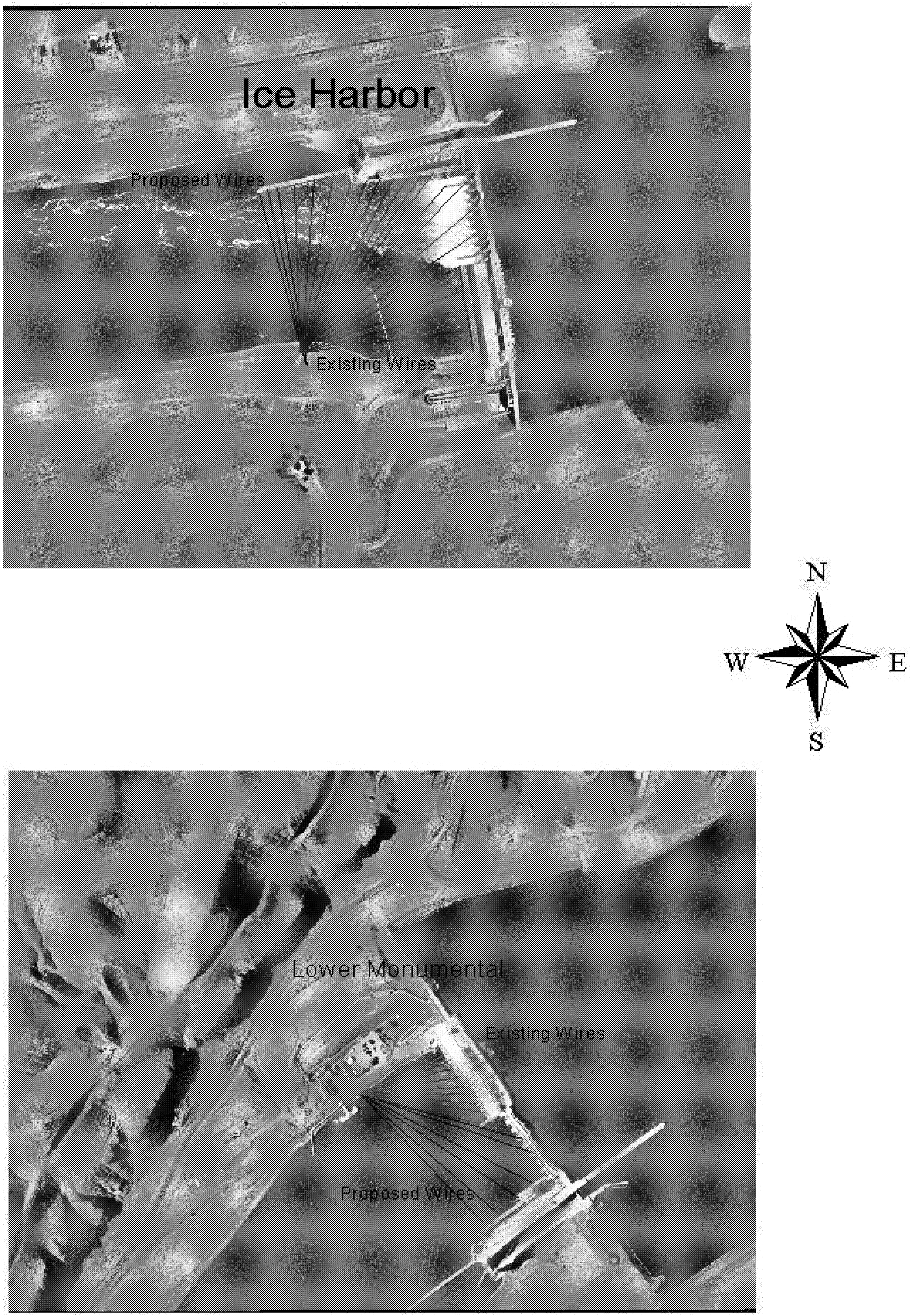



Plate 5 – Bird Exclusion Systems; existing and proposed at Ice Harbor and Lower Monumental Dams

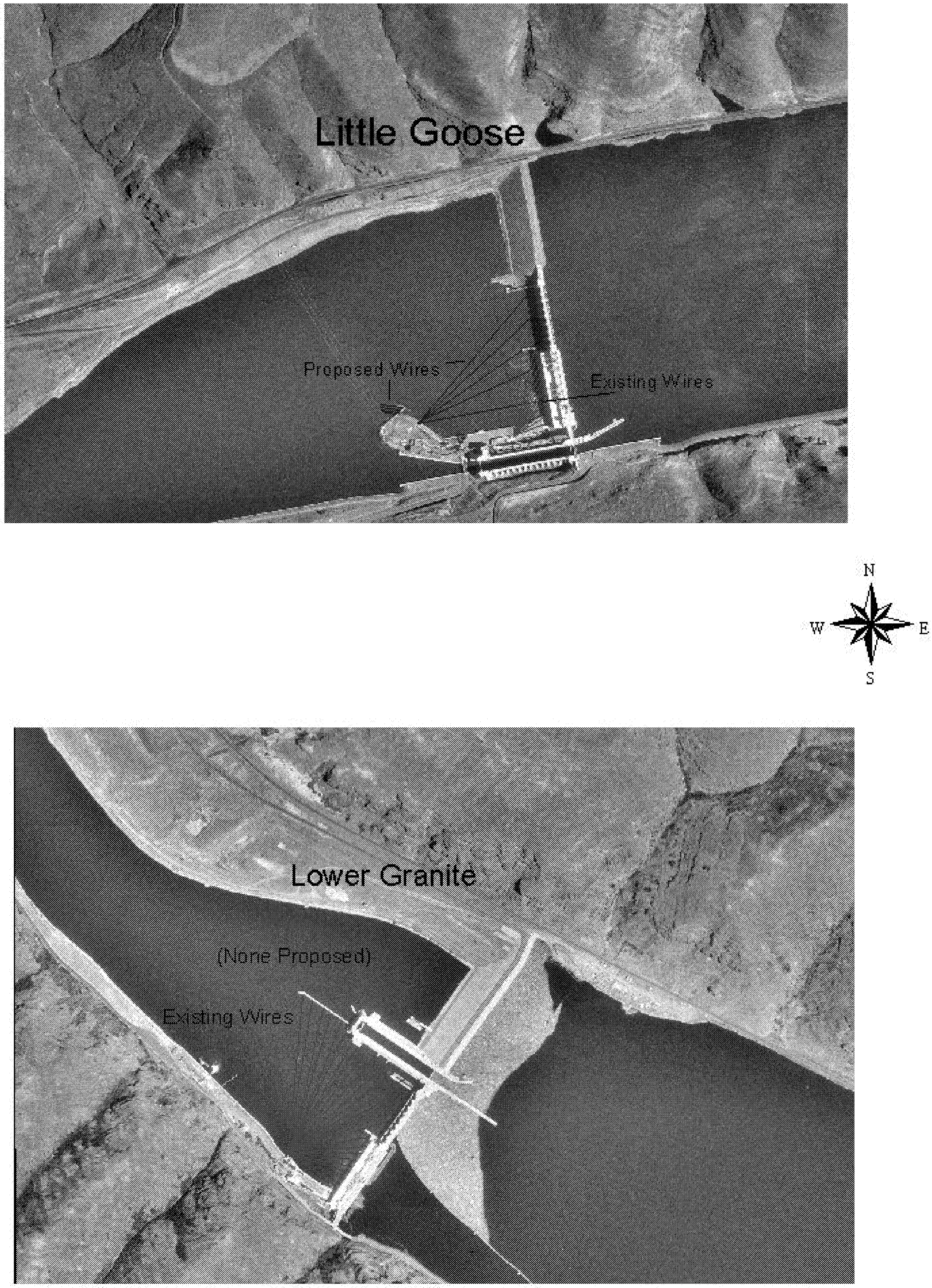


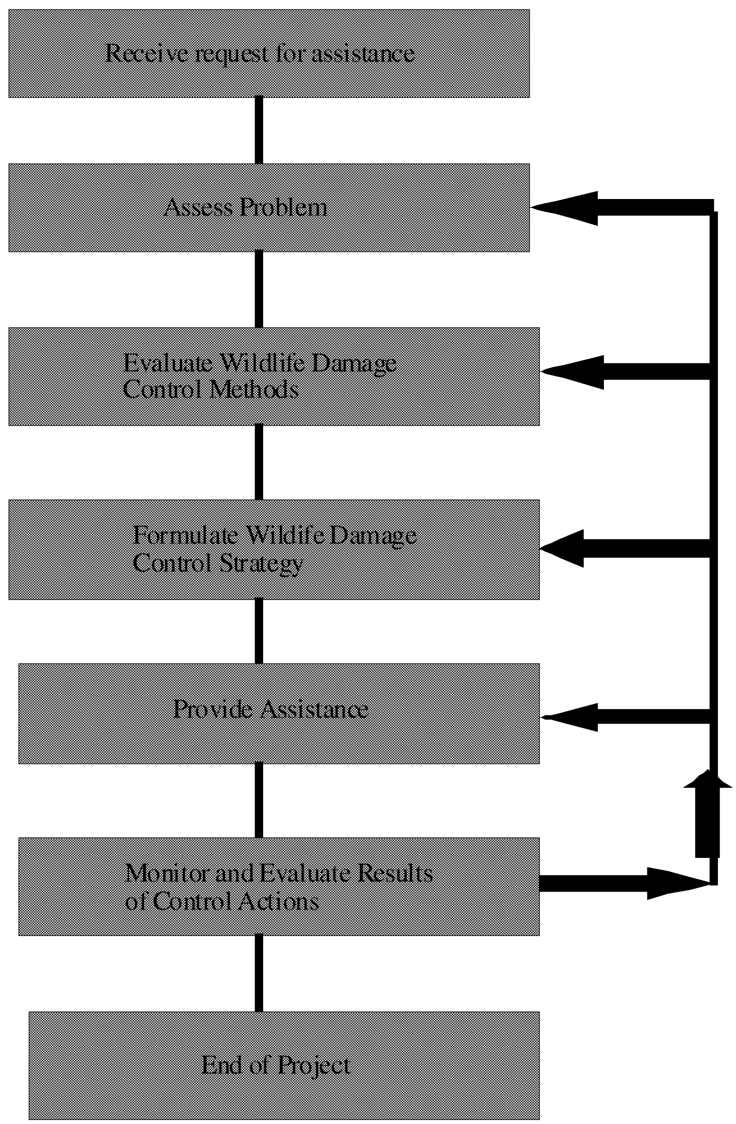

Plate 6 – Bird Exclusion Systems; existing and proposed at Little Goose and Lower Granite Dams

# APPENDIX B

## APHIS-WS DECISION MODEL

## APHIS-WILDLIFE SERVICES DECISION MODEL

The decision making process must be predicated on consideration of the specific biologic, socio-cultural, economic, physical, and other environmental circumstances associated with a given wildlife damage problem.



## APHIS ADC Decision Model

(USDA-APHIS-ADC Programmatic EIS, Chapter 2)

(all references to figures, tables and appendices pertain to the EIS, USDA 1997)

APHIS ADC personnel receive requests for assistance that encompass the broad range of wildlife damage problems. Some requests are relatively simple with straightforward solutions. Excluding squirrels from bird feeders or raccoons from chimneys represent typical examples. Requests for assistance to protect endangered species or human safety at airports are examples of more challenging problems in which a high level of interest is shown by various groups, organizations, and agencies. Unlike the previous squirrel and raccoon examples, the formulation, implementation, and success of an IPM strategy is frequently contingent on highly coordinated and cooperative efforts with many parties.

Each request for assistance is unique regardless of its complexity. Therefore, the decision-making process must be predicated on consideration of the specific biologic, socio-cultural, economic, physical, and other environmental circumstances associated with a given wildlife damage problem. Ideally, a variety of methods should be available for the decision-maker to formulate an effective IPM strategy (Table 2-4). Access to a variety of methods allows field personnel greater flexibility and a better opportunity to formulate an effective strategy for each specific request for assistance.

The decision-making steps APHIS ADC personnel take are fundamentally the same as those described in Chapter 1 for other professionals (Figure 1-1). The APHIS ADC decision model presented in Figure 2-4 is a more detailed version of the general professional action model (Figure 1-1) that was specifically developed to depict the APHIS ADC decision process. The compartment entitled “Evaluate Wildlife Damage Control Methods” from the APHIS ADC decision model (Figure 2-4) has been expanded to show the important factors given consideration at this step (Figure 2-5). The APHIS ADC decision model can be applied to the other program alternatives. Control methods selected under each alternative could be screened and evaluated leaving the wildlife manager with the best solution under the constraints of the alternative. Some methods available for evaluation and consideration in the formulation of control strategies are listed in Table 2-4. Representative, detailed examples of types of requests for assistance received by the APHIS ADC program have been developed to further demonstrate some of the complexities of formulating effective IPM strategies (Appendix N). The reader is encouraged to refer to these specific examples to gain a better understanding of the APHIS ADC decision process.

All Federal actions are subject to NEPA (PL 91-190, 42 U.S.C. 4321 et seq.). APHIS ADC complies with CEQ regulations implementing NEPA (40 CFR 1500 et seq.) and the APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process. The relationship of the NEPA process to APHIS ADC decision-making is shown in Figure 2-6.

Wildlife damage decision models can be useful management tools (Schmidt et al. 1985). They can serve as meaningful communication instruments as well. The decision model presented in Figure 2-4 is designed to serve as both these functions; however, it necessarily oversimplifies complex thought processes.

### Receive Request for Assistance

APHIS ADC is a service-oriented program that works on a request basis. Requests may be received by phone, in person, as referrals from others, or a variety of other means. Requests for assistance encompass a broad range of wildlife conflicts from nuisance wildlife in urban structures to more intricate problems, such as wildlife hazards to public safety, predation of livestock, or protection of endangered species.

**Assess Problem**
Each request undergoes an initial assessment to determine if the problem is within the purview of APHIS ADC. Requests determined to be within the purview of APHIS ADC are subjected to a detailed assessment of the damage.

**a) Purview Determination**
The diversity and scope of activities conducted by the APHIS ADC program is defined by Federal, State, and local laws, as well as MOUs and agreements. The purview of APHIS ADC varies among the 50 States in which the program is administered as a consequence of differences in State and local laws, MOUs, and agreements established with the APHIS ADC program in each State.

Most requests involving wildlife damage to agriculture, facilities and structures, or natural resources, or if wildlife poses a threat to public health and safety, result in APHIS ADC providing some type of wildlife damage management assistance. Requests to address problems that are clearly not within the responsibility or authority of the program in a State are usually referred to an appropriate source of assistance as a professional courtesy.

**b) Detailed Assessment of Damage**
In assessing the damage, immediate attention is given to confirming that damage was caused by vertebrate animals, the species responsible for damage, and the type of damage (e.g. bird hazard at an airport, loss of livestock, or flooded crops). Commonly this requires an inspection, depending on the type and complexity of the problem. Then severity of the problem is considered in deciding which management options are potentially applicable. During inspections, damages normally are confirmed by APHIS ADC personnel.

The extent and magnitude of damage is also important in assessing current and potential economic losses in the absence of control. The resource manager or affected party is usually the source of this type of information. Pertinent aspects of the damage history are also relevant. For example, is this a recurring problem or is it the first episode of this type? What control actions, if any, have been attempted by the resource manager or affected party? What were the results? If no further control action is taken, is damage likely to continue or recur?

**Evaluate Wildlife Damage Control Methods**
Once the problem assessment is completed, all available methods are evaluated for their practicality. Conceptually, this component of the APHIS ADC decision model consists of a series of legal, administrative, and environmental screens for each potential method (Figure 2-5). The result of this evaluation is one or more methods practical for further consideration in formulating alternative wildlife damage control strategies (see "Formulate Wildlife Damage Control Strategy" on p. 2-32).

A list of control methods for the 17 representative target species (analyzed in detail in Chapter 4) is provided in Table 2-4. To facilitate an understanding of the relative availability of control methods and who generally applies them, methods are organized under three action approaches to managing wildlife damage problems (Table 2-4).

One action approach is management of the resources susceptible to damage. It includes those activities designed to improve or modify current resource management practices, such as husbandry and cultural practices, as well as modification of human behavior. Application of these methods typically is the responsibility of the resource manager or affected party. However, APHIS ADC personnel make technical assistance recommendations concerning these methods.

A second action approach is placement of physical barriers to separate the resource that has sustained or is susceptible to damage from specific wildlife species. Fences, nets, and wire grids are examples of physical barrier methods. Like resource management methods, these are usually applied by the resource manager or affected party. APHIS ADC often makes technical assistance recommendations concerning the installation and improvement of physical barrier methods to reduce wildlife damage. APHIS ADC may also loan materials or demonstrate fencing or other physical exclusion methods.

A third approach, management of wildlife, includes habitat management, modification of wildlife behavior, and wildlife population management to reduce damage. Habitat management includes activities such as thinning trees from bird roosts or water level manipulation through removal of beaver dams, and is normally implemented by the resource manager or affected party. Modification of wildlife behavior includes the use of frightening devices, repellents, or lure crops. Population management includes translocation or lethal removal of wildlife from local populations. Behavior and population management methods may be conducted by either the resource manager, APHIS ADC personnel, or other wildlife damage control professionals, depending on legal and administrative considerations in each locale.

**a) Legal and Administrative Considerations**

Wildlife damage control methods are subject to legal and administrative authorities. For example, a method may be legal in one State and not another. Or, a method may be legal only in portions of a State (e.g. not allowed in heavily populated areas). The status of the target species (State or Federally listed as threatened or endangered), or the presence of listed species in the general area where control activities are proposed, may preclude the use of a method. The species may be a migratory bird, requiring a depredation permit in order to implement specific types of control actions. Also, the APHIS ADC program itself may restrict the use of specific methods by policy or agreement with other agencies or parties. Important questions that should be considered for each method during this phase of the assessment include:

- Is it legal, and administratively permissible to use the method on this species within the State where the request for assistance has been received?
- Is it legal, and administratively permissible to use the method to address this specific type of damage?
- If so, is it legal, and administratively permissible to use this method at the specific site for this request for assistance, or are there restrictions because of land class, other land use patterns, or the presence of listed species near the damage site?

All of the methods that pass these legal and administrative screens are available for further consideration in the decision process. It should be noted, however, that there are additional legal considerations with regard to who may apply (resource manager or affected party, APHIS ADC personnel, or others with expertise in wildlife damage management) methods considered under “Formulate Wildlife Damage Control Strategy” (see p. 2-32)

**b) Environmental Considerations**

During this phase of the assessment, each legally and administratively available method is evaluated with regard to pertinent aspects of the biological, physical, socio-cultural, and economic environments. A general question to be considered is: What are the positive or negative short or long-term direct, indirect, or cumulative environmental effects of implementing or not implementing control action with the method? Other important questions that should be considered in making decisions about each method are listed below.

**1) Biological Environment**

- What is the population status of the target species? Is it endangered or threatened; or is it relatively abundant?
- Are there any threatened or endangered or other potential non-target species in the area that could be affected either directly or indirectly in a positive or negative fashion by using the method?
- Are there any special behavioral traits of the target species, such as daily or seasonal movement patterns, that require consideration?
- Could the use of the method potentially affect biological diversity?

**2) Physical Environment**

- What effect would local weather or climatic patterns have on the use of the method?
- What effect would soil, water, air, elevation, or other physical habitat features have on the use of the method?
- What effect would the method have on soil, water, and air quality?
- What health and safety risks would the method pose to the applicator and the public?
- What health and safety risks would be posed to the public by not conducting control using the method?

**3) Economic Environment**

- Would the use of the method in this situation be likely to reduce damage?
- Does the magnitude of damage warrant the cost of applying the method?

**4) Socio-cultural Environment**

Evaluating methods in the socio-cultural environment frequently presents the greatest challenge because of differences in human attitudes toward wildlife species (Kellert 1976; Decker and Goff 1987), wildlife damage management methods (Stuby et al. 1979; Arthur 1981), and the resources damaged by wildlife (Connolly 1982). In spite of the difficulties associated with evaluating methods in the socio-cultural environment, societal values are important in decision-making and they deserve similar consideration in methods evaluation as the other environmental factors. Some important socio-cultural issues to consider in evaluating wildlife damage control methods include:

- What are the perceptions regarding the humaneness of the method?
- How acceptable would the risks of this method to non-target animals be to the resource manager or affected party and the general public?
- How acceptable is the effect of each method on the target animal–no effect, frighten, exclude, modify habitat, translocate, or kill–to the resource manager or affected party and the general public?

The methods evaluation should result in one or more methods available for further consideration in formulating a control strategy (Figure 2-5). However, as a function of this evaluation it is possible to determine that there are no practical methods available. This results in no action being recommended or taken.

**Formulate Wildlife Damage Control Strategy**
At this decision step, those control methods determined to be practical from the previous evaluation are formulated into a control strategy for the specific problem. In determining the sequence or combination of methods to be applied and who will apply them, preference is given to practical non-lethal methods. However, this does not mean that non-lethal methods must always be applied as a first response to each damage problem. Often the most appropriate response is a combination of non-lethal and lethal methods, and there will be instances where application of lethal methods alone is the most appropriate strategy.

**a) Strategy Considerations**

**1) Available Expertise**
As previously discussed, some control methods are usually applied by the resource manager or affected party. Other methods can be used by resource managers or other professional wildlife damage control personnel, and still others may only be applied by APHIS ADC personnel.

The availability of expertise to address each specific request for assistance may influence the balance of technical assistance and direct control activities when formulating the IPM strategy. Relatively simple damage problems may be adequately addressed through technical assistance. However, effective solutions to many damage problems require an integration of those methods used by the resource manager with direct control services provided by the APHIS ADC program or other professional wildlife damage managers. The availability of APHIS ADC expertise for direct control to address complex damage problems is dependent on cooperative or congressionally directed funding. Cooperators are generally more inclined to provide funding for problems requiring special expertise than for those problems they can either solve on their own or through technical assistance. In addition, Federal and State legislators are more likely to appropriate public funds to solve problems requiring special equipment, materials, and expertise.

**2) Legal Constraints on Method Users**
Screening was previously performed (see “Legal and Administrative Considerations” on p. 2-30) to determine which methods were legally and administratively permissible for this problem. It is necessary here to consider any additional legal constraints on methods that define who may apply each method. The avicide DRC 1339, for example, can be used only by USDA personnel trained in bird damage control or persons under their direct supervision. Use of the livestock protection (LP) collar is restricted to specially trained and certified LP collar applicators that may be APHIS ADC employees (see Appendix Q).

**3) Cost**
Cost effectiveness is an obvious goal in wildlife damage management. However, the costs of implementing wildlife damage management cannot be considered independently from the damage problem, probable environ-mental impacts, and other strategy considerations.

The costs of methods and their application should be weighed against the severity of damage. Even in cases involving serious damage, lack of funds may constrain the resource manager or affected party from hiring special expertise adequate to solve the problem.

In relatively simple wildlife damage problems, such as excluding squirrels or raccoons from urban structures, the provision of technical assistance is usually sufficient and the least costly means of providing a solution. Difficult wildlife damage problems are usually not as easily or effectively resolved through technical assistance alone. For example, a livestock producer who is using all practical, state-of-the-art resource management and physical barrier methods may also require direct control assistance to successfully constrain continuing losses. In this scenario, the monetary costs for implementing an IPM strategy include both the costs of direct control applied by APHIS ADC and the costs incurred by the resource manager for implementing resource management and physical barrier methods.

Off-site or indirect benefits have to be considered as well. For example, the costs associated with the suppression of an offending coyote population at one location may be relatively high. But when costs are considered in the context of the benefit of avoided or continuing loss of sheep in neighboring areas, the costs of implementing the control strategy may be low.

Overriding social concerns often preclude the use of the most cost-effective methods. The use of pyrotechnic frightening devices in and around developed areas to reduce damage caused by birds may not be recommended or used because of noise, aesthetic, or other social concerns. Safe and effective lethal methods may not be used in a variety of circumstances primarily because of social considerations.

Short and long-term costs and benefits of wildlife damage management strategies also are important. Methods such as the propane cannon have substantially higher initial costs in comparison to pyrotechnics, yet may be less expensive when labor is factored into the strategy budget.

#### 4) Relative Effectiveness of Methods

Subject to other constraints and considerations previously discussed, APHIS ADC personnel attempt to recommend the most effective method or combination of methods to resolve problems. Effectiveness of a method or combination of methods must take into account the variables previously discussed, such as legal and administrative availability and practicality, as well as their monetary costs, negative environmental impacts, and most importantly their ability to reduce damage. Ideally, a method or combination of methods should be selected that produces maximum damage resolution with minimal negative environmental impacts (Owens and Slate 1991).

### Provide Assistance

APHIS ADC program service is delivered to the public by two basic means: technical assistance and direct control. Technical assistance is the provision of advice, recommendations, information, or materials for use in managing wildlife damage problems. Its emphasis is on helping others help themselves. Technical assistance may require substantial effort by APHIS ADC personnel in the decision-making process, but the actual control activities are the responsibility of the resource manager or affected party. Direct control is the implementation of control activities by APHIS ADC personnel in the field. Direct control is typically provided when funding is available and technical assistance alone is inadequate (see p. 2-17 through 2-20 for a more comprehensive description of technical assistance and direct control). Direct control by APHIS ADC or other appropriately trained wildlife personnel should be employed when actions may affect sensitive species or sensitive areas of the public domain or involve certain hazardous materials (Berryman 1972).

## Monitor and Evaluate Results of Control Actions

If control measures have been provided by APHIS ADC, it is usually necessary to monitor control actions to determine if they are achieving the desired results. Return site visits or telephone contacts with the resource manager represent the most common forms of monitoring conducted by APHIS ADC personnel. Site visits or phone contacts are also required to monitor equipment placed in the field by APHIS ADC personnel to assess if it is functioning properly, or to determine if any animals have been captured.

Monitoring control actions is an important step in determining if further assistance is required to responsibly address the problem. Monitoring also allows APHIS ADC personnel to know when to discontinue control activities, thus reducing unnecessary environmental impacts and monetary expenditures.

The need for additional assistance is usually identified through routine monitoring and evaluation of control actions by APHIS ADC personnel. If the recommended strategy is having an effect but damage has not abated, continuation of the strategy or reevaluation may be in order, as represented by the feedback loop shown in Figure 2-4.

## End of Project

A project is considered completed for APHIS ADC whenever program personnel are no longer directly involved in control activity for that specific problem. For many projects that are addressed through technical assistance alone, APHIS ADC involvement in the project ends when the recommendations or advice is provided to those making the request. Some direct control projects, such as the removal of a single family of beaver and the associated dams responsible for flooding a road or dispersing blackbirds from an urban roost, have well-defined end points. Other projects, such as chronic predation on livestock or at aquaculture facilities, may require continuing attention at various times of the year. These types of projects have no well-defined end points.

# APPENDIX C

## BIOLOGICAL ASSESSMENT

# APPENDIX D

## FISH PASSAGE PLAN

(CY04 Excerpts)
http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/

| | Winter Maintenance Period | Juvenile Fish Passage Season | Reporting |
|---|---|---|---|
| **Bonneville** | **First Powerhouse**<br>**2.4.1.1.g. Avian Abatement Measures.** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Avian abatement measures shall be in place by April 1 unless this work is delayed because of inclement weather. If this occurs, the work will be completed as soon as the weather permits after that date. However, there will be no avian abatement measures, other than avian lines, performed from September through March each year.<br><br>**Second Powerhouse**<br>**2.4.2.1.i. Avian Predation Lines.** Reinstall or repair avian predator control lines in present locations as soon as possible following significant damage or removal. Install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Avian abatement measures shall be in place by April 1 unless this work is delayed because of inclement weather. If this occurs, the work will be completed as soon as the weather permits after that date. However, there will be no avian abatement measures, other than avian lines, performed from September through March each year. | **First Powerhouse**<br>**2.4.1.2.k.** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Where possible, install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary from April through August only.<br>**Second Powerhouse**<br>**2.4.2.2.J.** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Where possible, install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary from April through August only.<br><br>**Fish Transport Pipe and Flume**<br>**2.4.2.4.b.5.** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Where possible, install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary from April through August only.<br><br>**Juvenile Monitoring Facility**<br>**2.4.2.5.b.5.** Monitor outfall avian cannons. | **2.6.3** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |

| | Winter Maintenance Period | Juvenile Fish Passage Season | Reporting |
|---|---|---|---|
| **The Dalles** | **2.4.1.1.e.** Reinstall or repair avian predator control lines in the present locations as soon as possible following damage or removal. Install and maintain new avian predator control lines where possible, in locations determined to be significantly impacted by avian predators. Avian abatement measures shall be in place by April 1 unless this work is delayed because of inclement weather. If this occurs, the work will be completed as soon as the weather permits after that date. However, there will be no avian abatement measures, other than avian lines, performed from September through March each year. | **2.4.1.2.h.** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Where possible, install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary from April through August only. | **2.6** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |
| **John Day** | **2.4.1.1.j. Avian Abatement Measures.** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Avian abatement measures shall be in place by April 1, unless this work is delayed because of inclement weather. If this occurs, the work will be completed as soon as the weather permits after that date. However, there will be no avian abatement measures, other than avian lines, performed from September through March each year. | **2.4.1.2.l** Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary in areas where avian lines are not practical. Implement other avian abatement measures as necessary from April through August only. | **2.6** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |
| **McNary** | **2.3.1.1.f. Avian Predation Areas (Forebay and Tailrace).** Inspect bird wires and other deterrent devices and repair or replace as needed. Where possible, install additional bird wires or other deterrent devices to cover areas of known avian predation activity. | **2.3.2.1.f. Avian Predation Areas (Forebay and Tailrace).**<br>**1**. Bird wires and other avian deterrent devices should be monitored to assure they are in good condition. Any broken wires or devices should be replaced as soon as possible.<br>**2**. Harassment program in place to deter avian predation in areas actively used by birds and not covered by bird wires or other devices.<br>**3**. Project biologists shall routinely monitor project areas to determine areas of active avian predation and, if possible, adjust harassment program to cover these areas or install bird wires or other deterrent devices to discourage avian predation activities. | **2.3.3** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |

| | Winter Maintenance Period | Juvenile Fish Passage Season | Reporting |
|---|---|---|---|
| **Ice Harbor** | **f. Avian Predation Areas (Forebay and Tailrace).**<br>Inspect bird wires and other deterrent devices and repair or replace as needed. Where possible, install additional bird wires or other deterrent devices to cover areas of known avian predation activity. | **f. Avian Predation Areas (Forebay and Tailrace).**<br>**1**. Bird wires and other avian deterrent devices should be monitored to assure they are in good condition. Any broken wires or devices should be replaced as soon as possible.<br>**2**. Harassment program in place to deter avian predation in areas actively used by birds and not covered by bird wires or other devices.<br>**3**. Project biologists shall routinely monitor project areas to determine areas of active avian predation and, if possible, adjust harassment program to cover these areas or install bird wires or other deterrent devices to discourage avian predation activities. | **2.3.3** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |
| **Lower Monumental** | **f. Avian Predation Areas (Forebay and Tailrace).**<br>Inspect bird wires and other deterrent devices and repair as needed. Where possible, install additional bird wires or other deterrent devices to cover areas of known avian predation activity. | **f. Avian Predation Areas (Forebay and Tailrace).**<br>**1**. Bird wires and other avian deterrent devices should be monitored to assure they are in good condition. Any broken wires or devices should be replaced as soon as possible.<br>**2**. Harassment program in place to deter avian predation in areas actively used by birds and not covered by bird wires or other devices.<br>**3**. Project biologists shall routinely monitor project areas to determine areas of active avian predation and, if possible, adjust harassment program to cover these areas or install bird wires or other deterrent devices to discourage avian predation activities. | **2.3.3** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |

| | Winter Maintenance Period | Juvenile Fish Passage Season | Reporting |
|---|---|---|---|
| **Little Goose** | **f. Avian Predation Areas (Forebay and Tailrace).**<br>Inspect bird wires and other deterrent devices and repair or replace as needed. Where possible, install additional bird wires or other deterrent devices to cover areas of known avian predation activity. | **f. Avian Predation Areas (Forebay and Tailrace).**<br>**1**. Bird wires and other avian deterrent devices should be monitored to assure they are in good condition. Any broken wires or devices should be replaced as soon as possible.<br>**2**. Harassment program in place to deter avian predation in areas actively used by birds and not covered by bird wires or other devices.<br>**3**. Project biologists shall routinely monitor project areas to determine areas of active avian predation and, if possible, adjust harassment program to cover these areas or install bird wires or other deterrent devices to discourage avian predation activities. | **2.3.3** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |
| **Lower Granite** | **g. Avian Predation Areas (Forebay and Tailrace).**<br>Inspect bird wires and replace as needed. Where possible, add additional bird wires or other deterrent devices to cover areas of known avian predation activity. | **e. Avian Predation Areas (Forebay and Tailrace).**<br>**1**. Bird wires and other avian deterrent devices should be monitored to assure they are in good condition. Any broken wires or devices should be replaced as soon as possible.<br>**2**. Harassment program in place to deter avian predation in areas actively used by birds and not covered by bird wires or other devices.<br>**3**. Project biologists shall routinely monitor project areas to determine areas of active avian predation and, if possible, adjust harassment program to cover these areas or install bird wires or other deterrent devices to discourage avian predation activities. | **2.3.3** The annual report shall also include a description of all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the activities in discouraging avian predation. |

# APPENDIX E

## CULTURAL RESOURCE INVENTORY REPORT

# APPENDIX F

## COMPOSITE ENDANGERED AND THREATENED SPECIES LIST

### USFWS Reference # 1-7-03-SP-094 (Portland), 1-3-04-SP –556 (updates 1-3-03-SP-0568 - Lacey), and 1-9-04-SP-0145 (updates 1-9-03SP-0142 - Spokane)

1. Snake River sockeye salmon (*Oncorhynchus nerka*) - **endangered November 1991**
2. Upper Columbia River spring-run Chinook salmon (*O. tshawytscha*) - **endangered March 1999**
3. Lower Columbia River Chinook - **threatened March 1999**
4. Snake River fall-run Chinook - **threatened April 1992**
5. Snake River spring/summer Chinook - **threatened April 1992**
6. Upper Columbia River steelhead (*O. mykiss*) - **endangered August 1997**
7. Mid-Columbia River steelhead - **threatened March 1999**
8. Lower Columbia River steelhead - **threatened March 1998**
9. Snake River basin steelhead - **threatened August 1997**
10. Columbia River chum salmon (*O. keta*) – threatened March 1999
11. Bull trout (*Salvelinus confluentus*) – threatened June 1998
12. Bald eagle (*Haliaeetus leucocephalus*) – threatened February 1978
13. Golden paintbrush (*Castilleja levisecta*) – threatened June 1997
14. Northern spotted owl (*Strix occidentalis caurina*) – threatened July 1990
15. Ute ladies-tresses (*Spiranthes divulvialis*) – threatened January 1992
16. Spalding's silene (catchfly) (*Silene spaldingii*) – threatened October 2001
17. Canada Lynx (*Lynx canadensis*) (Bonneville) – threatened March 2000
18. Gray Wolf (*Canis lupes*) (Bonneville) – threatened March 1967
19. Grizzly Bear (*Ursus arctos* = *U. a. horribilus*) (Bonneville) – threatened March 1967
20. Critical habitat for northern spotted owl - **designated** (Bonneville) -
21. Critical habitat for bull trout - **proposed**
22. Yellow-billed cuckoo (*Coccyzus americanus*) - **candidate**
23. Washington ground squirrel (*Spermophilus washingtoni*) – **candidate**
24. Oregon spotted frog (*Rana pretiosa*) - **candidate**
25. Coho salmon (Lower Columbia River) (*O. kisutch*) - **candidate**
26. Northern wormwood (*Artemisia campestris* ssp. w*ormskioldii*) - **candidate**
27. Mardon Skipper (*Polites mardon*) **candidate** (Bonneville)

# APPENDIX G

## IMPACT TO AVIAN PREDATORS

Analysis of this issue is limited to those species lethally removed during APD management. The analysis for magnitude of impact (See also Section 4.0.1 Method of Analysis of this document) generally follows the process described in Chapter 4 of the USDA-APHIS-WS Programmatic EIS (1997, revised) which defines magnitude as "*...a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable take levels, and actual take data. Qualitative determinations are based on population trends and take data when available. Tables 1 through 9 of this Appendix show, by species and location, the numbers of birds killed and hazed at Corps hydroelectric dams as a result of APD management on the Lower Columbia and Snake Rivers between 1997 and 2001. Tables 10 through 18 of this Appendix show, by month and location, the numbers of birds killed and hazed at Corps hydroelectric dams. The predominant months for APD activity are April through July, which correspond with juvenile salmonid migration.

Precise counts of the bird populations addressed in this EA do not exist. Table A provides population data presented at the Anadromous Fish Evaluation Program Annual Review 2002 (CORPS 2002c) and CORPS 2002b.

**Table A. Estimated Colony Population Data for Piscivorous Birds in 2002**

| Species | Location | Population |
|---|---|---:|
| Gull colony | Little Miller Island | 3,487 |
| | Three Mile Canyon Island | 792 |
| | Richland Island | 1,003 |
| | Island 18 | 529 |
| Cormorant colony | Foundation Island | 3,541 |
| Caspian tern colony | Crescent Island | 1,160 |
| | East Sand Island | 19,866 |
| | West Tern Island | 174 |
| | Solstice Island | 1,153 |
| Pelican colony | Badger Island | 216 |

(Corps 2002 b,c; Collis et. al. 2002b)

When precise population estimates are lacking, it is common practice for management agencies to use population trend analyses to determine if species populations are 'increasing', 'stable', or 'decreasing'. These trend analyses are determined by taking actual counts at specific locations at regular intervals and comparing several years of data. When the Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) routes do not include habitat commonly used by piscivorous birds, direction from wildlife management agencies and published literature, such as those mentioned above, may be used to determine population trends. Often times, published literature provides some of the best information available on population trends.

**Breeding Bird Survey**

The BBS is a large-scale survey initiated 1966 to monitor the status and trends of breeding birds throughout North America. This survey has provided more than 30 years of data on abundance, distribution, and population trends for more than 400 bird species (Downes and Collins 2003). These data are calculated annually by the United States Geologic Survey (USGS) Patuxent Wildlife Research Center. The BBS index is taken from the BBS, a summer count survey conducted by volunteers and coordinated by the USGS to monitor long-term population trends at the state, regional, and national level. Like other surveys, the BBS is based on a number of assumptions, biases, and limitations. For example, the BBS is limited by placement of roads, traffic noise interference in some cases, and preference of some bird species for roadside habitats (Bystrak 1981). Given that 22% of the species in the survey can be characterized as birds with specialized habitats or limited distribution in the BBS range (Sauer et al. 2001). This survey has not characteristically been the best population monitoring tools for colonial nesting species such as gulls, terns, and cormorants. BBS counts of all the species discussed in this EA can be highly variable and inconsistent from one year to the next. The BBS generally uses roads for survey routes, and as such, it has not characteristically been the best population-monitoring tool for colonial nesting species such as gulls and cormorants. A measure of the statistical significance of a trend is represented by a “P” value. The USFWS has stated that those species with “P” values greater than 0.1 do not show trend estimates with an acceptable level of certainty or significance (USDA 2001). BBS data are provided at http://www.mbr-pwrc.usgs.gov/bbs.html.

**Christmas Bird Count**

The CBC index is derived from a winter count survey conducted by the National Audubon Society (NAS) in December and January, and is used primarily as a historical reference to indicate declines in species at the state, regional, and national level. The 100-year population trend analysis was derived from CBC survey year 1901 through 2001 in both Washington and Oregon States. , Unlike the BBS, large portions of the Columbia River and the Lower Columbia and Snake Rivers are surveyed by the CBC. Winter weather patterns often affect bird migrations, therefore these counts vary from year to year. CBC data are provided at http://www.audubon.org/bird/cbc/hr/.

**Published Literature**

California gulls, ring-billed gulls, and double-crested cormorants are the primary avian predators in the Columbia River basin (NMFS 2000b). A fairly large body of published literature exists which documents population trends and other biological information for these species.

Sightings of these species in the Columbia River basin were rare to non-existent 60 years ago (NMFS 2000b). Since that time, populations have dramatically increased due to the expansion of cities and landfills, the advent of large-scale agriculture, the creation of islands and reservoirs, and protection granted under the Migratory Bird Treaty Act (USDA 2001).

### 1. *Gulls*

**Breeding Bird Survey**

*California gull*:

BBS data throughout the United States are inconclusive due to high levels of variance. BBS routes within USFWS Region 1 (Pacific States) documented downward trends of -4.7% ($p<0.01$) between 1966 and 2000 and -5.1% ($p<0.01$) between 1980 and 2000 (Sauer et al. 2001).

*Ring-billed gull*:

Survey-wide within the United States, the BBS documented an upward trend of 4.6% ($p<0.01$) between 1966 and 2000 and 3.5% ($p<0.01$) between 1980 and 2000 (Sauer et al. 2001). BBS routes within USFWS Region 1 documented an upward trend of 2.9% ($p<0.06$) between 1980 and 2000 (Sauer et al. 2001). Summer distribution of ring-billed gulls is concentrated in eastern and south-central Oregon State (www.mbr-pwrc.usgs.gov), and BBS routes do not survey the Lower Columbia River. Regardless, in Oregon State, the BBS documented downward trends of -9.7% ($p<0.03$) between 1966 and 2000, and -9.7% ($p<0.08$) between 1980 and 2000 (Sauer et al. 2001).

*Herring gull*:

No statistically significant data are available for BBS routes within Washington State, Oregon State, USFWS Region 1, or survey-wide within the United States.

**Christmas Bird Count**

*California gull*:

The winter CBC survey for Washington and Oregon States show an increasing population trend between 1901 and 1970, with a total of 21 counted in both States up to the year 1916. The California gull population trend increased between 1970 and 2001, with approximately 6,400 documented in Washington and Oregon States in the 2001 winter survey.

*Ring-billed gull*:

The 1901-2001 winter CBC surveys for Washington and Oregon States show an increasing population trend. Washington ring-billed gull trends increased from a high of 900 in 1953, to 7,800 in 2000. In Oregon State, population trends increased from a high of 1,500 in 1963 to peaks of 13,000 in 1983 and 12,600 in 1992. The 2001 winter survey for both States documented approximately 9,600 ring-billed gulls.

*Herring gull*:
CBC surveys for Washington and Oregon States show a stable or slightly increasing population trend. Washington herring gull counts peaked in 1958 (814), 1982 (1,171), and 1986 (1,517). In Oregon State, counts peaked in 1956 (2,000), 1976 (2,264), and 1984 (2,025). The 2001 winter survey for both States documented approximately 1,300 herring gulls.

**Published Literature**
In North America, the California gull is distributed north to south from the Northwest and Nunavut Territory, Canada, to Mono Lake and south San Francisco Bay, California, and from the Dakotas in the east to the Pacific Ocean (Winkler 1996). The breeding population in Washington State was approximately 138,000 pairs in 1980 (Conover 1983), not including sub-adults, which become sexually mature at 4 years of age. Average life expectancy is unknown, but the oldest band-recovered bird was 27 years old. The annual sub-adult survival is 92% and 75%-79% for adults (Winkler 1996).

In North America, this species is widely distributed and increasing (Conover 1983; USDA 1997 revised; USDA 2001) throughout the provinces of Canada and Great-Lakes region, west to the Pacific coast, and south from Washington State to central Mexico, the Gulf of Mexico and eastward through the Mississippi Valley and along the Atlantic coast north to Massachusetts. An estimated 3 to 4 million individuals inhabited North America in 1990, and 2001 population estimates for Washington State may number approximately 390,000 breeding individuals, based on 106,000 birds and a 6.4% growth rate reported by Conover (1983) in 1980. Ring-billed gulls become sexually mature at 4 years of age and have a life expectancy of approximately 20 years (Southern 1975).

Herring gulls are distributed from the Atlantic coast, north to Baffin Island and throughout arctic Canada into eastern Alaska. From Alaska, their range expands south along the Pacific coast to the Baja Peninsula and the Gulf of Mexico. Only non-breeding birds appear to be migratory and winter throughout Washington State. Herring gulls become sexually mature at 4 years of age, have an annual adult survivorship of 80-85%, and a life expectancy of approximately 15-20 years (Kadlec and Drury 1968).

California and ring-billed gulls are both species of wildlife damage management concern in Washington State (Jones et al. 1999; NMFS 2000b; USDA 2001), and feed upon juvenile salmonids at hydroelectric dams throughout the Columbia River basin (Jones et al. 1996, 1997, 1998, 1999; USDA 2001). The Washington Ornithological Society (WOS) (1999-2001) shows California and ring-billed gulls to be commonly abundant residents of eastern and western Washington State during juvenile salmonid migrations. Herring gulls are commonly abundant in eastern Washington State in October through April (WOS 1999-2001).

According to the published literature, populations of California and ring-billed gulls are increasing throughout the State (Conover 1983; USDA 2001).

- In 1982, approximately 6,000 California and 5,600 ring-billed gulls were recorded near Richland, WA. Fifteen years later, Roby et al. (1998) estimated over 70,000 California and ring-billed gulls occupying the same area.
- In 1995, mixed colonies of California and ring-billed gulls occupied 17 islands from Chief Joseph Dam downstream to The Dalles Dam (York et al. 2000). Gull populations on 5 of those 17 islands were estimated at 35,000 breeding adults.
- In 1996, York et al. (2000) recorded a breeding population of 7,000 ring-billed gulls and 200 California gulls on Cabin Island, 1.5 km upstream of Priest Rapids Dam.

A study conducted with the NAS Research Department, discussed the impact of lethal control on large populations of gulls. No effective controls were known to lower gull populations over large expanses (Thomas 1972), and that while island gull populations may be reduced over a period as long as 10 years, the lower densities resulting from control programs may improve the health and reproductive capacity of the surviving individuals (Coulson et al. 1982). The NAS Research Department also made reference to situations where control efforts have killed hundreds of gulls, which had little long-term effect because most gull populations are large enough to replace even substantial losses in the breeding population from non-breeders (Kadlec and Drury 1968).

**Summary of impacts to gulls**
The Non-Lethal Tools Only alternative is not likely, nor designed, to impact gull populations on a Statewide basis. APHIS-WS EA and FONSI (2001a) on migratory birds analyzed the impacts of migratory bird damage management activities in Washington State, which included discussions on California, ring-billed, and herring gulls. In that analysis, which included the cumulative impact of gulls taken at Corps facilities, the USFWS concurred that the take level of California, ring-billed, and herring gulls for the purpose of site-specific damage control was not likely to effect populations at the regional or national scale (USDA 2001). Overall, based upon recent and historical studies conducted on California and ring-billed gulls in the Pacific Northwest, these trends show populations that currently appear to be healthy and increasing, and herring gull populations that appear to be stable. The preferred alternative would have no bearing on these populations.

### *2. Double-crested cormorants*

**Breeding Bird Survey**
No significant population trends were verified at the State or regional level, however, throughout the United States the BBS documented an upward trend of 7.6% ($p<0.03$) between 1966 and 2000, and 9.4% ($p<0.04$) between 1980 and

2000 (Sauer et al. 2001). Site-specific, individual BBS routes which survey lakes and rivers suggest that the double-crested cormorant population is increasing, particularly so east of the Cascade Range (Sauer et al. 2001).

**Christmas Bird Count**
The 1901-2001 winter CBC surveys for Washington and Oregon States show an increasing population trend. Washington State double-crested cormorant trends increased from a high of 96 in 1956, to 7,300 in 2001. In Oregon State, the population trends increased from a high of 180 in 1954, to 2,900 in 2001.

**Published Literature**
Double-crested cormorant distribution in Washington State is described by Smith et al. (1997). The double-crested cormorant is widely distributed in North America, occurring as far south as San Salvador and the Caribbean, north along the coastal shores of Quebec, and northwest along the Alaskan Peninsula. The recent increase in the North American population has been well documented (USDA 1999; USDA 2001). Van de Veen (1973) found that over 20% of breeders of a slowly increasing (8% per year) Pacific coast population were only one to two years of age, and thereby calculated that most birds breed at the beginning of their fourth year and a life expectancy of 6.1 years.

The WOS (1999-2001) showed the double-crested cormorant to be present, but uncommon (i.e., site-selective) residents from April through September in eastern Washington State and commonly abundant, year-round residents of western Washington. In the 1800s and early 1900s, numbers of cormorants declined along the Pacific coast. In Washington and Oregon States, double-crested cormorant populations have increased over the last few decades (Roby et al. 1998; Collis et al. 1999; Sauer et al. 2001).

**Summary of impacts to double-crested cormorants**
The No-Action alternative is not likely, nor designed, to impact double-crested cormorant populations on a statewide basis. The reduction of double-crested cormorant usage of site-specific areas where juvenile salmonids are unnaturally exposed and susceptible to predation may require that some individuals be lethally removed. It is the goal of the Corps to reduce avian predation of ESA-listed and non-listed juvenile salmonids, as required under the ESA, rather than to control or manage fish and wildlife populations, and as such, there have been no discernable impact on double-crested cormorant population levels. APHIS-WS' EA (2001) on migratory birds analyzed the impacts of migratory bird damage management activities in Washington State, which included discussions on double-crested cormorants. In that analysis, which included the cumulative impact of double-crested cormorants taken at Corps facilities, the USFWS concurred that the double-crested cormorant take level, for the purpose of site-specific damage control, was not likely to effect populations at the regional or national scale (USDA 2001). Overall, based upon recent and historical studies conducted on double-crested cormorants in the Pacific Northwest, these trends show populations that currently appear to be healthy and increasing.

### *3. Secondary Avian Predators*

In the past, limited lethal control of western grebes, great-blue herons, and mergansers (Table 1) has been authorized when individuals congregate in or below fish ladders, spillways, and outfalls, and only when non-lethal deterrents have been ineffective. No lethal control of secondary avian predators would occur under the preferred alternative – Non-Lethal Tools Only. State agencies have expressed concern for great-blue heron colonies.

American white pelicans are listed as a Washington State endangered species. The American white pelican's persistence and use patterns below the McNary Dam complex implicates them as contributors to juvenile salmonid mortality. They were first consistently observed in the tailrace in small numbers in mid-April. A maximum instantaneous count of 24 pelicans was recorded. The diel foraging pattern of the pelicans generally coincided with the diel pattern of salmonid passage through the bypass system. Bird deterrent measures employed at the dam for other piscivorous birds initially altered the foraging behavior of the American white pelicans. However, the pelicans rapidly acclimated (CORPS 2003).

Migratory birds would not be killed under the preferred alternative. American white pelicans would only be intentionally hazed if they take up residence within 50 feet of the juvenile fish outfall for longer than 10 minutes. All secondary predators, including great-blue herons and white pelicans, may be subject to non-lethal measures when congregated at the same site-specific areas where juvenile salmonids are unnaturally exposed and susceptible to predation.

### Table 1 – Yearly Summary of Species Hazed and Killed at All Project Sites

| Project | (All) |
|---|---|

| | | Year | | | | | |
|---|---|---|---|---|---|---|---|
| Species | Data | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| american white pelican | killed | 0 | 0 | | | | 0 |
| | hazed | 2 | 6 | | | | 489 |
| belted kingfisher | killed | | | | 0 | | 0 |
| | hazed | | | | 7 | | 4 |
| bonaparte gull | killed | | | | | | 0 |
| | hazed | | | | | | 478 |
| california gull | killed | 44 | 5 | 366 | 227 | 986 | 94 |
| | hazed | 56 | 0 | 2893 | 7001 | 11157 | 16119 |
| caspian tern | killed | 0 | | 0 | 0 | 0 | **1 |
| | hazed | 2 | | 32 | 13 | 283 | 612 |
| common merganser | killed | 1 | 0 | | 0 | | 0 |
| | hazed | 0 | 80 | | 4 | | 2 |
| dabbling duck | killed | | | | 0 | | |
| | hazed | | | | 50 | | |
| diving duck | killed | | | | 0 | | |
| | hazed | | | | 12 | | |
| double-crested cormorant | killed | 121 | 202 | 229 | 182 | 95 | 6 |
| | hazed | 1627 | 1999 | 1963 | 4256 | 4074 | 7583 |
| forster tern | killed | 0 | 7 | 0 | 0 | 0 | 0 |
| | hazed | 6 | 3 | 50 | 226 | 68 | 63 |
| great-blue heron | killed | 0 | 7 | 0 | 0 | 0 | 0 |
| | hazed | 6 | 3 | 50 | 226 | 68 | 50 |
| herring gull | killed | 3 | 10 | 29 | 93 | 18 | 48 |
| | hazed | 0 | 0 | 0 | 1240 | 151 | 2767 |
| mallard | killed | | | | 0 | | |
| | hazed | | | | 15 | | |
| osprey | killed | | | 0 | | | |
| | hazed | | | 12 | | | |
| red-breasted merganser | killed | | | | 0 | | |
| | hazed | | | | 101 | | |
| ring-billed gull | killed | 49 | 389 | 2844 | 906 | 499 | 530 |
| | hazed | 2670 | 2106 | 26125 | 24421 | 11365 | 29448 |
| unidentified grebe | killed | | | | | | 15 |
| | hazed | | | | | | 823 |
| unidentified gull | killed | 675 | 2589 | | 0 | | |
| | hazed | 9689 | 14492 | | 22 | | |
| western grebe | killed | 66 | 73 | 80 | 4 | 35 | |
| | hazed | 1011 | 885 | 106 | 1824 | 510 | |
| Total | killed | 956 | 3265 | 3519 | 1319 | 1615 | 694 |
| | hazed | 15063 | 19571 | 31181 | 37952 | 27457 | 58478 |

** unintentional take caused by a misdirected pyrotechnic

## Table 2 – Yearly Summary of Species Hazed and Killed at Bonneville

| Project | **Bonneville** |
|---|---|

| | | Year | | | | |
|---|---|---|---|---|---|---|
| Species | Data | 1998 | 1999 | 2000 | 2001 | 2002 |
| belted kingfisher | killed | | | 0 | | |
| | hazed | | | 1 | | |
| california gull | killed | | 62 | 30 | 122 | 13 |
| | hazed | | 54 | 84 | 560 | 1190 |
| caspian tern | killed | | | | 0 | |
| | hazed | | | | 12 | |
| common merganser | killed | | | 0 | | |
| | hazed | | | 4 | | |
| dabbling duck | killed | | | 0 | | |
| | hazed | | | 18 | | |
| diving duck | killed | | | 0 | | |
| | hazed | | | 12 | | |
| double-crested cormorant | killed | | | 45 | 29 | 1 |
| | hazed | | | 390 | 592 | 1376 |
| great-blue heron | killed | | 0 | 0 | 0 | 0 |
| | hazed | | 50 | 202 | 44 | 5 |
| herring gull | killed | | 28 | 16 | 0 | 7 |
| | hazed | | 0 | 35 | 11 | 502 |
| mallard | killed | | | 0 | | |
| | hazed | | | 15 | | |
| red-breasted merganser | killed | | | 0 | | |
| | hazed | | | 6 | | |
| ring-billed gull | killed | 22 | 321 | 228 | 89 | 8 |
| | hazed | 40 | 900 | 935 | 360 | 1234 |
| western grebe | killed | | | 0 | | |
| | hazed | | | 46 | | |
| Total | killed | 22 | 411 | 319 | 240 | 29 |
| | hazed | 40 | 1004 | 1733 | 1579 | 4307 |

## Table 3 – Yearly Summary of Species Hazed and Killed at The Dalles

| Project | **The Dalles** |
|---|---|

| | | Year | | | | | |
|---|---|---|---|---|---|---|---|
| Species | Data | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| california gull | killed | 22 | 5 | 70 | 42 | 414 | 22 |
| | hazed | 56 | 0 | 1225 | 2735 | 5201 | 9726 |
| caspian tern | killed | | | | 0 | 0 | **1 |
| | hazed | | | | 2 | 49 | 139 |
| dabbling duck | killed | | | | 0 | | |
| | hazed | | | | 20 | | |
| double-crested cormorant | killed | 23 | 55 | 80 | 68 | 25 | 0 |
| | hazed | 741 | 1159 | 875 | 2686 | 2117 | 2096 |
| great-blue heron | killed | 0 | 5 | | 0 | 0 | |
| | hazed | 6 | 2 | | 2 | 12 | |
| herring gull | killed | 1 | 2 | | 33 | 2 | 18 |
| | hazed | 0 | 0 | | 665 | 110 | 1446 |
| red-breasted merganser | killed | | | | | | |
| | hazed | | | | 95 | | |
| ring-billed gull | killed | 23 | 92 | 493 | 124 | 70 | 29 |
| | hazed | 57 | 18 | 6109 | 9072 | 2966 | 4637 |
| unidentified grebe | killed | | | | | | 0 |
| | hazed | | | | | | 4 |
| unidentified gull | killed | 469 | 1292 | | | | |
| | hazed | 2930 | 5046 | | | | |
| western grebe | killed | 0 | 15 | 16 | 2 | 6 | |
| | hazed | 14 | 507 | 68 | 257 | 160 | |
| Total | killed | 538 | 1451 | 643 | 267 | 511 | 70 |
| | hazed | 3790 | 6225 | 8209 | 15277 | 10455 | 18048 |

** unintentional take caused by a misdirected pyrotechnic

## Table 4 – Yearly Summary of Species Hazed and Killed at John Day

| Project | John Day |
|---|---|

| | | Year | | | | | |
|---|---|---|---|---|---|---|---|
| Species | Data | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| belted kingfisher | killed | | | | 0 | | |
| | hazed | | | | 6 | | |
| california gull | killed | 22 | | 234 | 155 | 446 | 55 |
| | hazed | 0 | | 1614 | 4182 | 5396 | 4588 |
| caspian tern | killed | | | | 0 | 0 | 0 |
| | hazed | | | | 11 | 219 | 2 |
| common merganser | killed | 1 | | | | | |
| | hazed | 0 | | | | | |
| dabbling duck | killed | | | | | | |
| | hazed | | | | 12 | | |
| double-crested cormorant | killed | 6 | 65 | 85 | 61 | 33 | 4 |
| | hazed | 161 | 177 | 121 | 1152 | 722 | 616 |
| great-blue heron | killed | | 2 | | 0 | 0 | 0 |
| | hazed | | 1 | | 22 | 12 | 1 |
| herring gull | killed | 2 | 8 | 1 | 44 | 16 | 23 |
| | hazed | 0 | 0 | 0 | 540 | 30 | 778 |
| ring-billed gull | killed | 13 | 260 | 1571 | 406 | 180 | 34 |
| | hazed | 54 | 59 | 11323 | 9591 | 3492 | 2739 |
| unidentified grebe | killed | | | | | | 0 |
| | hazed | | | | | | 654 |
| unidentified gull | killed | 206 | 1297 | | 0 | | |
| | hazed | 5134 | 9281 | | 22 | | |
| western grebe | killed | 66 | 58 | 64 | 2 | 24 | |
| | hazed | 997 | 378 | 38 | 1521 | 350 | |
| Total | killed | 110 | 393 | 1955 | 668 | 699 | 116 |
| | hazed | 1212 | 615 | 13096 | 17037 | 10221 | 9378 |

**Table 5 – Yearly Summary of Species Hazed and Killed at McNary**

| Project | **McNary** |
|---|---|

| | | Year | | | | | |
|---|---|---|---|---|---|---|---|
| Species | Data | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| american white pelican | killed | | 0 | | | | 0 |
| | hazed | | 80 | | | | 333 |
| bonaparte gull | killed | | | | | | 0 |
| | hazed | | | | | | 478 |
| california gull | killed | | 0 | | | | 4 |
| | hazed | | 80 | | | | 615 |
| caspian tern | killed | | 0 | | | | 0 |
| | hazed | | 80 | | | | 330 |
| common merganser | killed | | 0 | | | | |
| | hazed | | 80 | | | | |
| double-crested cormorant | killed | | 29 | 10 | 3 | 3 | 0 |
| | hazed | | 184 | 6 | 0 | 0 | 512 |
| herring gull | killed | | | | | | 0 |
| | hazed | | | | | | 19 |
| forster tern | killed | | 0 | | | | 0 |
| | hazed | | 80 | | | | 63 |
| ring-billed gull | killed | 11 | 3 | 275 | | 2 | 3 |
| | hazed | 0 | 1654 | 2912 | | 0 | 3575 |
| western grebe | killed | | | | | 5 | |
| | hazed | | | | | 0 | |
| unidentified gull | killed | 0 | 0 | | | | |
| | hazed | 150 | 165 | | | | |
| unidentified grebe | killed | | | | | | 15 |
| | hazed | | | | | | 143 |
| Total | killed | 11 | 32 | 285 | 3 | 10 | 22 |
| | hazed | 150 | 2083 | 2918 | 0 | 0 | 6068 |

## Table 6 – Yearly Summary of Species Hazed and Killed at Ice Harbor

| Project | Ice Harbor |
|---|---|

| | | Year | | | | |
|---|---|---|---|---|---|---|
| Species | Data | 1997 | 1998 | 1999 | 2001 | 2002 |
| american white pelican | killed | 0 | 0 | | | 0 |
| | hazed | 2 | 6 | | | 156 |
| belted kingfisher | killed | | | | | 0 |
| | hazed | | | | | 4 |
| caspian tern | killed | 0 | | 0 | | 0 |
| | hazed | 2 | | 32 | | 141 |
| common merganser | killed | | | | | 0 |
| | hazed | | | | | 2 |
| double-crested cormorant | killed | 92 | 26 | 49 | 0 | 1 |
| | hazed | 725 | 470 | 942 | 108 | 2396 |
| great-blue heron | killed | | | | | 0 |
| | hazed | | | | | 41 |
| herring gull | killed | | | | | 0 |
| | hazed | | | | | 22 |
| osprey | killed | | | 0 | | |
| | hazed | | | 12 | | |
| ring-billed gull | killed | 0 | 0 | 0 | 0 | 3 |
| | hazed | 1769 | 105 | 961 | 68 | 3757 |
| unidentified grebe | killed | | | | | 0 |
| | hazed | | | | | 22 |
| unidentified gull | killed | 0 | | | | |
| | hazed | 1475 | | | | |
| Total | killed | 92 | 26 | 49 | 0 | 4 |
| | hazed | 3973 | 581 | 1947 | 176 | 6541 |

## Table 7 – Yearly Summary of Species Hazed and Killed at Lower Monumental

| Project | Lower Monumental |
|---|---|

| | | Year | | | | | |
|---|---|---|---|---|---|---|---|
| Species | Data | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| california gull | killed | | | | | 4 | |
| | hazed | | | | | 0 | |
| caspian tern | killed | | | | | 0 | |
| | hazed | | | | | 3 | |
| double-crested cormorant | killed | | 2 | 5 | 0 | 5 | 0 |
| | hazed | | 9 | 19 | 28 | 535 | 587 |
| great-blue heron | killed | | | | | | 0 |
| | hazed | | | | | | 3 |
| ring-billed gull | killed | 2 | 12 | 3 | 1 | 34 | 84 |
| | hazed | 790 | 230 | 1174 | 1335 | 2798 | 10653 |
| Total | killed | 2 | 14 | 8 | 1 | 43 | 84 |
| | hazed | 790 | 239 | 1193 | 1363 | 3336 | 11243 |

## Table 8 – Yearly Summary of Species Hazed and Killed at Little Goose

| Project | Little Goose |
|---|---|

| | | Year | | | |
|---|---|---|---|---|---|
| Species | Data | 1999 | 2000 | 2001 | 2002 |
| double-crested cormorant | killed | | 5 | | |
| | hazed | | 0 | | |
| ring-billed gull | killed | 111 | 135 | 105 | 280 |
| | hazed | 1030 | 1589 | 852 | 1269 |
| Total | killed | 111 | 140 | 105 | 280 |
| | hazed | 1030 | 1589 | 852 | 1269 |

## Table 9 – Yearly Summary of Species Hazed and Killed at Lower Granite

| Project | Lower Granite |
|---|---|

| | | Year | | | | |
|---|---|---|---|---|---|---|
| Species | Data | 1998 | 1999 | 2000 | 2001 | 2002 |
| double-crested cormorant | killed | 25 | | | | |
| | hazed | 0 | | | | |
| ring-billed gull | killed | | 70 | 12 | 19 | 89 |
| | hazed | | 1716 | 1899 | 829 | 1624 |
| Total | killed | 25 | 70 | 12 | 19 | 89 |
| | hazed | 0 | 1716 | 1899 | 829 | 1624 |

## Table 10 – 5-Year (1997-2001) Summary by Month of Species Hazed and Killed at All Projects

Year (All)

| Project | (All) | Month | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | Data | **January** | **February** | **March** | **April** | **May** | **June** | **July** | **August** | **September** | **October** | **November** | **December** | **Grand Total** |
| american white pelican | Killed | | | | | | | | | | | | | |
| | Hazed | | | | | 2 | 6 | | | | | | | 8 |
| belted kingfisher | Killed | | | | | | | | | | | | | |
| | Hazed | | | | | 7 | | | | | | | | 7 |
| california gull | Killed | 2 | 2 | 9 | 136 | 384 | 490 | 310 | 193 | 29 | | | 73 | 1628 |
| | Hazed | 1 | | 56 | 1150 | 3306 | 4108 | 4345 | 1124 | 543 | 1111 | 4404 | 959 | 21107 |
| caspian tern | Killed | | | | | | | | | | | | | |
| | Hazed | | | | 22 | 16 | 10 | 98 | 135 | 49 | | | | 330 |
| common merganser | Killed | | | | 1 | | | | | | | | | 1 |
| | Hazed | | | | | 4 | | | | | | | 80 | 84 |
| dabbling duck | Killed | | | | | | | | | | | | | |
| | Hazed | | | | | 50 | | | | | | | | 50 |
| diving duck | Killed | | | | | | | | | | | | | |
| | Hazed | | | | | 12 | | | | | | | | 12 |
| double-crested cormorant | Killed | 114 | 37 | 41 | 66 | 181 | 70 | 12 | 13 | 95 | 28 | 35 | 137 | 829 |
| | Hazed | 1393 | 496 | 1150 | 858 | 2269 | 310 | 99 | 128 | 1490 | 2653 | 1402 | 1671 | 13919 |
| great-blue heron | Killed | | | | 2 | 2 | | 1 | | | 1 | | 1 | 7 |
| | Hazed | 3 | 3 | 40 | | 218 | 75 | 10 | | 1 | | 3 | | 353 |
| herring gull | Killed | 6 | 3 | 4 | 12 | 29 | 5 | 9 | 22 | 6 | | 20 | 37 | 153 |
| | Hazed | 2 | | | 140 | 157 | 148 | 273 | 317 | 50 | | 304 | | 1391 |
| mallard | Killed | | | | | | | | | | | | | |
| | Hazed | | | | | 15 | | | | | | | | 15 |
| osprey | Killed | | | | | | | | | | | | | |
| | Hazed | | | | 12 | | | | | | | | | 12 |
| red-breasted merganser | Killed | | | | | | | | | | | | | |
| | Hazed | | | | | 6 | | | | | | 95 | | 101 |
| ring-billed gull | Killed | 47 | 180 | 71 | 634 | 1740 | 1371 | 212 | 116 | 89 | 2 | 98 | 127 | 4687 |
| | Hazed | 716 | 233 | 317 | 6688 | 24710 | 15144 | 5071 | 1617 | 390 | 910 | 6438 | 4453 | 66687 |
| unidentified gull | Killed | | | | 150 | 1875 | 452 | 415 | 156 | 95 | 37 | 62 | 22 | 3264 |
| | Hazed | 40 | 300 | 296 | 2944 | 14284 | 2080 | 1638 | 386 | 222 | 668 | 463 | 882 | 24203 |
| western grebe | Killed | 2 | 10 | 2 | 14 | 56 | 78 | 24 | 14 | 8 | 9 | 13 | 28 | 258 |
| | Hazed | 113 | | 7 | 348 | 424 | 588 | 81 | 28 | 88 | 1181 | 1222 | 256 | 4336 |
| Total Killed | | 171 | 232 | 127 | 1015 | 4267 | 2466 | 983 | 514 | 322 | 77 | 228 | 425 | 10827 |
| Total Hazed | | 2268 | 1032 | 1866 | 12162 | 45480 | 22469 | 11615 | 3735 | 2833 | 6523 | 14331 | 8301 | 132615 |

## Table 11 – 5-Year Summary by Month of Species Hazed and Killed at Bonneville

| Year | (All) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project | **Bonneville** | Month | | | | | | | | | | |
| Species | Data | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **June** | **July** | **Aug** | **Sept** | **Dec** | **Grand Total** |
| belted kingfisher | Killed | | | | | | | | | | | |
| | Hazed | | | | | 1 | | | | | | 1 |
| california gull | Killed | 2 | 1 | 2 | 52 | 48 | | | 43 | 4 | 62 | 214 |
| | Hazed | 1 | | | 120 | 213 | | | 310 | | 54 | 698 |
| caspian tern | Killed | | | | | | | | | | | |
| | Hazed | | | | | | | | 12 | | | 12 |
| common merganser | Killed | | | | | | | | | | | |
| | Hazed | | | | | 4 | | | | | | 4 |
| dabbling duck | Killed | | | | | | | | | | | |
| | Hazed | | | | | 18 | | | | | | 18 |
| diving duck | Killed | | | | | | | | | | | |
| | Hazed | | | | | 12 | | | | | | 12 |
| double-crested cormorant | Killed | 5 | 4 | 6 | 27 | 25 | | | 3 | 3 | 1 | 74 |
| | Hazed | 80 | 80 | 341 | 209 | 114 | 20 | | 22 | 16 | 100 | 982 |
| great-blue heron | Killed | | | | | | | | | | | |
| | Hazed | | | 40 | | 190 | 66 | | | | | 296 |
| herring gull | Killed | 4 | | | | 12 | | | | | 28 | 44 |
| | Hazed | | | | 6 | 29 | | | 11 | | | 46 |
| mallard | Killed | | | | | | | | | | | |
| | Hazed | | | | | 15 | | | | | | 15 |
| red-breasted merganser | Killed | | | | | | | | | | | |
| | Hazed | | | | | 6 | | | | | | 6 |
| ring-billed gull | Killed | 19 | | 17 | 37 | 265 | 203 | 44 | 15 | 23 | 37 | 660 |
| | Hazed | 61 | 15 | 40 | 198 | 749 | 451 | 479 | 110 | 40 | 92 | 2235 |
| western grebe | Killed | | | | | | | | | | | |
| | Hazed | | | | | 46 | | | | | | 46 |
| Total Killed | | 30 | 5 | 25 | 116 | 350 | 203 | 44 | 61 | 30 | 128 | 992 |
| Total Hazed | | 142 | 95 | 421 | 533 | 1397 | 537 | 479 | 465 | 56 | 246 | 4371 |

## Table 12 – 5-Year Summary by Month of Species Hazed and Killed at The Dalles

| Year | (All) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project | **The Dalles** | Month | | | | | | | | | | |
| Species | Data | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **June** | **July** | **Aug** | **Sept** | **Dec** | Grand Total |
| california gull | Killed | | | 1 | 29 | 136 | 168 | 161 | 41 | 11 | | 553 |
| | Hazed | | | 20 | 720 | 1184 | 1646 | 2297 | 352 | 57 | 621 | 9217 |
| caspian tern | Killed | | | | | | | | | | | |
| | Hazed | | | | | | 9 | 40 | 2 | | | 51 |
| dabbling duck | Killed | | | | | | | | | | | |
| | Hazed | | | | | 20 | | | | | | 20 |
| double-crested cormorant | Killed | 58 | 23 | 20 | 12 | 5 | 3 | 12 | 4 | 49 | 21 | 251 |
| | Hazed | 987 | 239 | 762 | 150 | 24 | 12 | 77 | 103 | 1235 | 2165 | 7578 |
| great-blue heron | Killed | | | | 2 | 2 | | | | | | 5 |
| | Hazed | 3 | 2 | | | 6 | 3 | 4 | | 1 | | 22 |
| herring gull | Killed | | 2 | | | 3 | 2 | 2 | 20 | 6 | | 38 |
| | Hazed | 2 | | | 110 | 4 | 100 | 190 | 160 | 30 | | 775 |
| red-breasted merganser | Killed | | | | | | | | | | | |
| | Hazed | | | | | | | | | | | 95 |
| ring-billed gull | Killed | 11 | 5 | 36 | 186 | 283 | 80 | 36 | 33 | 16 | | 802 |
| | Hazed | 236 | 75 | 155 | 1230 | 2902 | 5528 | 2474 | 810 | 179 | 583 | 18222 |
| unidentified gull | Killed | | | | 81 | 893 | 274 | 293 | 97 | 88 | | 1761 |
| | Hazed | | 61 | 74 | 987 | 3572 | 807 | 1413 | 297 | 166 | 235 | 7976 |
| western grebe | Killed | 2 | | | | | | 9 | 6 | 4 | 2 | 39 |
| | Hazed | 113 | | 3 | | 34 | 50 | 53 | 16 | 3 | 505 | 1006 |
| Total Killed | | 71 | 30 | 57 | 310 | 1322 | 527 | 513 | 201 | 174 | 23 | 3449 |
| Total Hazed | | 1341 | 377 | 1014 | 3197 | 7746 | 8155 | 6548 | 1740 | 1671 | 4109 | 44962 |

## Table 13 – 5-Year Summary by Month of Species Hazed and Killed at John Day

| Year | (All) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project | **John Day** | Month | | | | | | | | | | |
| Species | Data | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **June** | **July** | **Aug** | **Sept** | **Dec** | **Grand Total** |
| belted kingfisher | Killed | | | | | | | | | | | |
| | Hazed | | | | | 6 | | | | | | 6 |
| california gull | Killed | | 1 | 6 | 55 | 196 | 322 | 149 | 109 | 14 | | 857 |
| | Hazed | | | 36 | 310 | 1909 | 2462 | 2048 | 462 | 486 | 490 | 11192 |
| caspian tern | Killed | | | | | | | | | | | |
| | Hazed | | | | | 1 | 1 | 58 | 121 | 49 | | 230 |
| common merganser | Killed | | | | 1 | | | | | | | 1 |
| | Hazed | | | | | | | | | | | |
| dabbling duck | Killed | | | | | | | | | | | |
| | Hazed | | | | | 12 | | | | | | 12 |
| double-crested cormorant | Killed | 39 | 10 | 15 | 9 | 26 | 6 | | 1 | 43 | 7 | 250 |
| | Hazed | 320 | 177 | 47 | 46 | 19 | 7 | 22 | 3 | 239 | 488 | 2333 |
| great-blue heron | Killed | | | | | | | 1 | | | 1 | 2 |
| | Hazed | | 1 | | | 22 | 6 | 6 | | | | 35 |
| herring gull | Killed | 2 | 1 | 4 | 12 | 14 | 3 | 7 | 2 | | | 71 |
| | Hazed | | | | 24 | 124 | 48 | 83 | 146 | 20 | | 570 |
| ring-billed gull | Killed | 12 | 167 | 18 | 304 | 680 | 929 | 132 | 68 | 50 | 2 | 2430 |
| | Hazed | 384 | 143 | 63 | 1932 | 6904 | 6714 | 2089 | 697 | 171 | 327 | 24519 |
| unidentified gull | Killed | | | | 69 | 982 | 178 | 122 | 59 | 7 | 37 | 1503 |
| | Hazed | 40 | 239 | 222 | 1957 | 9317 | 1193 | 225 | 89 | 56 | 433 | 14437 |
| western grebe | Killed | | 10 | 2 | 14 | 56 | 78 | 15 | 3 | 4 | 7 | 214 |
| | Hazed | | | 4 | 348 | 344 | 538 | 28 | 12 | 85 | 676 | 3284 |
| Total Killed | | 53 | 189 | 45 | 464 | 1954 | 1516 | 426 | 242 | 118 | 54 | 5328 |
| Total Hazed | | 744 | 560 | 372 | 4617 | 18658 | 10969 | 4559 | 1530 | 1106 | 2414 | 56618 |

### Table 14 – 5-Year Summary by Month of Species Hazed and Killed at McNary

| Year | (All) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Project | **McNary** | Month | | | | | | | |
| Species | Data | January | February | May | June | August | November | December | Grand Total |
| common merganser | Killed | | | | | | | | |
| | Hazed | | | | | | | 80 | 80 |
| double-crested cormorant | Killed | 12 | | | | | 1 | 32 | 45 |
| | Hazed | 6 | | | | | | 184 | 190 |
| ring-billed gull | Killed | 5 | 8 | 202 | 72 | | 1 | 3 | 291 |
| | Hazed | 35 | | 2110 | 767 | | 752 | 902 | 4566 |
| unidentified gull | Killed | | | | | | | | |
| | Hazed | | | | | | 180 | 135 | 315 |
| western grebe | Killed | | | | | 5 | | | 5 |
| | Hazed | | | | | | | | |
| Total Killed | | 17 | 8 | 202 | 72 | 5 | 2 | 35 | 341 |
| Total Hazed | | 41 | | 2110 | 767 | | 932 | 1301 | 5151 |

### Table 15 – 5-Year Summary by Month of Species Hazed and Killed at Ice Harbor

| Year | (All) | | | | |
|---|---|---|---|---|---|
| Project | **Ice Harbor** | Month | | | |
| Species | Data | April | May | June | Grand Total |
| american white pelican | Killed | | | | |
| | Hazed | | 2 | 6 | 8 |
| caspian tern | Killed | | | | |
| | Hazed | 21 | 13 | | 34 |
| double-crested cormorant | Killed | 11 | 123 | 33 | 167 |
| | Hazed | 256 | 1838 | 151 | 2245 |
| osprey | Killed | | | | |
| | Hazed | 12 | | | 12 |
| ring-billed gull | Killed | | | | |
| | Hazed | 325 | 2442 | 136 | 2903 |
| unidentified gull | Killed | | | | |
| | Hazed | | 1395 | 80 | 1475 |
| Total Killed | | 11 | 123 | 33 | 167 |
| Total Hazed | | 614 | 5690 | 373 | 6677 |

### Table 16 – 5-Year Summary by Month of Species Hazed and Killed at Lower Monumental

| Year | (All) | | | | | |
|---|---|---|---|---|---|---|
| Project | **Lower Monumental** | Month | | | | |
| Species | Data | April | May | June | August | Grand Total |
| california gull | Killed | | 4 | | | 4 |
| | Hazed | | | | | |
| caspian tern | Killed | | | | | |
| | Hazed | 1 | 2 | | | 3 |
| double-crested cormorant | Killed | 2 | 2 | 3 | 5 | 12 |
| | Hazed | 197 | 274 | 120 | | 591 |
| ring-billed gull | Killed | 14 | 32 | 6 | | 52 |
| | Hazed | 857 | 5037 | 433 | | 6327 |
| Total Killed | | 16 | 38 | 9 | 5 | 68 |
| Total Hazed | | 1055 | 5313 | 553 | | 6921 |

### Table 17 – 5-Year Summary by Month of Species Hazed and Killed at Little Goose

| Year | (All) | | | | | | |
|---|---|---|---|---|---|---|---|
| Project | **Little Goose** | Month | | | | | |
| Species | Data | March | April | May | June | July | Grand Total |
| double-crested cormorant | Killed | | 5 | | | | 5 |
| | Hazed | | | | | | |
| ring-billed gull | Killed | | 66 | 219 | 66 | | 351 |
| | Hazed | 33 | 714 | 2163 | 546 | 15 | 3471 |
| Total Killed | | | 71 | 219 | 66 | | 356 |
| Total Hazed | | 33 | 714 | 2163 | 546 | 15 | 3471 |

### Table 18 – 5-Year Summary by Month of Species Hazed and Killed at Lower Granite

| Year | (All) | | | | | | |
|---|---|---|---|---|---|---|---|
| Project | **Lower Granite** | Month | | | | | |
| Species | Data | March | April | May | June | July | Grand Total |
| double-crested cormorant | Killed | | | | 25 | | 25 |
| | Hazed | | | | | | |
| ring-billed gull | Killed | | 27 | 59 | 15 | | 101 |
| | Hazed | 26 | 1432 | 2403 | 569 | 14 | 4444 |
| Total Killed | | | 27 | 59 | 40 | | 126 |
| Total Hazed | | 26 | 1432 | 2403 | 569 | 14 | 4444 |

# APPENDIX H

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# APPENDIX I

## RESPONSES FROM CONSULTATION